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The Journal
of the
SOCIETY OF DYERS AND COLOURISTS

Volume 72 Number 12

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THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY · BRADFORD 1 · YORKSHIRE

Notice to Authors of Papers

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

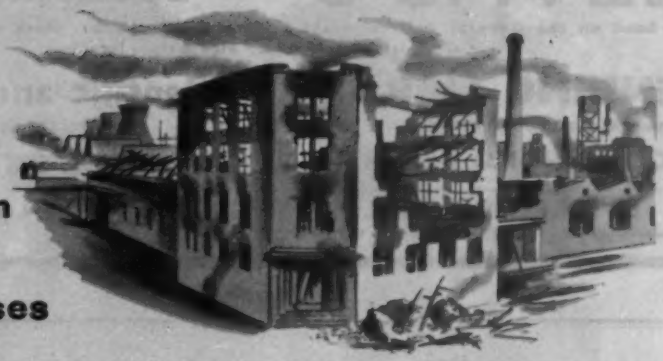
The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the Index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

Twenty-five free copies of a reprint are supplied to the author of an original paper published in the *Journal*, or fifty free copies are supplied when there are two or more authors, and a further number may be purchased from the Society at the rates given below.

REPRINTS OF LECTURES AND COMMUNICATIONS

Reprints of all lectures and communications are available after publication to members and non-members of the Society. The charges (postage included) are as follows— Single copies 2s. 6d. each; per dozen copies up to and including 8 pages, 12s. 6d., and for papers occupying more than 8 pages of the *Journal*, 17s. Orders should be addressed to "The Society of Dyers and Colourists, 19 Piccadilly, Bradford 1". They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.



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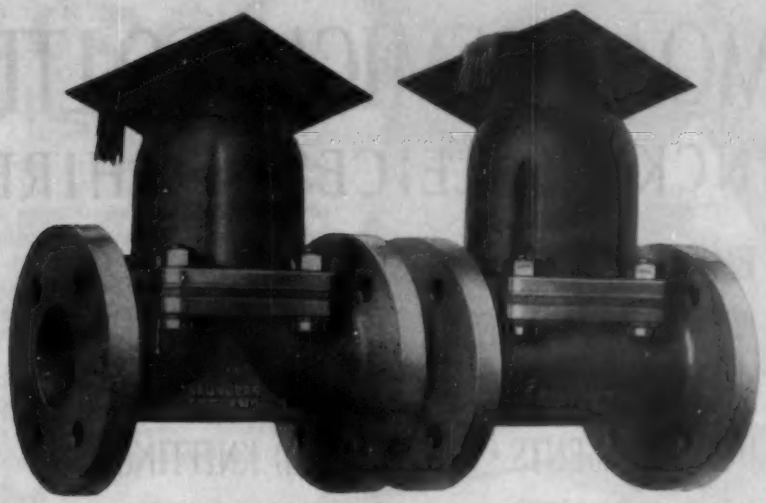

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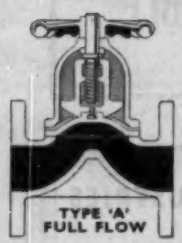

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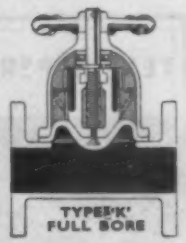

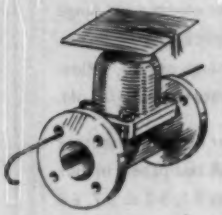

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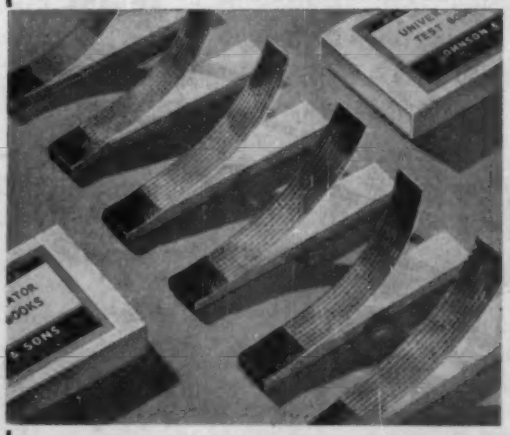

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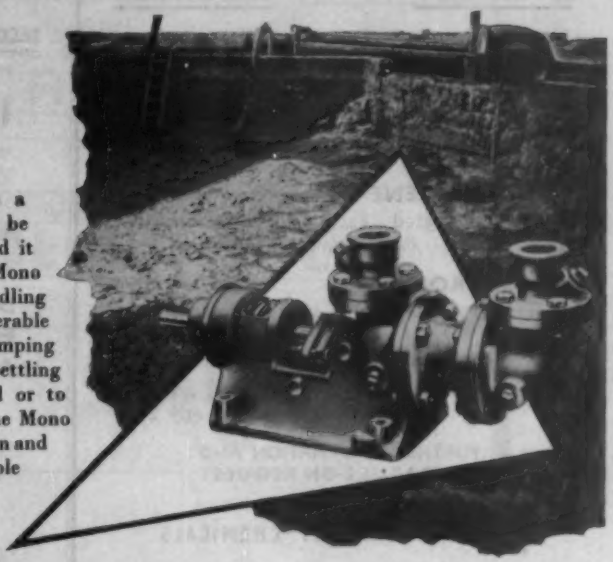

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Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1–6 of the January 1956 and pages 313–317 of the July 1956 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (*Telephone* Bradford 25138–9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal* —

COMMUNICATIONS

The Chemistry of Esters of Leuco Vat Dyes	*S. Ainsworth and A. Johnson*
Measurement of Diffusion Coefficients of Azoic Coupling Components in Cellulose	*A. S. Dunn*
Light Fastness Assessments of Dyed Textiles and their Bearing upon the Mechanism of Fading	*J. C. Eaton and C. H. Giles*
Separation of Disperse Dyes by Paper Chromatography	*K. Elliott and L. A. Telesz*
Absorption of Alkali by Wool Keratin from Aqueous Solutions of Sodium Carbonate and Bicarbonate	*R. P. Harker*

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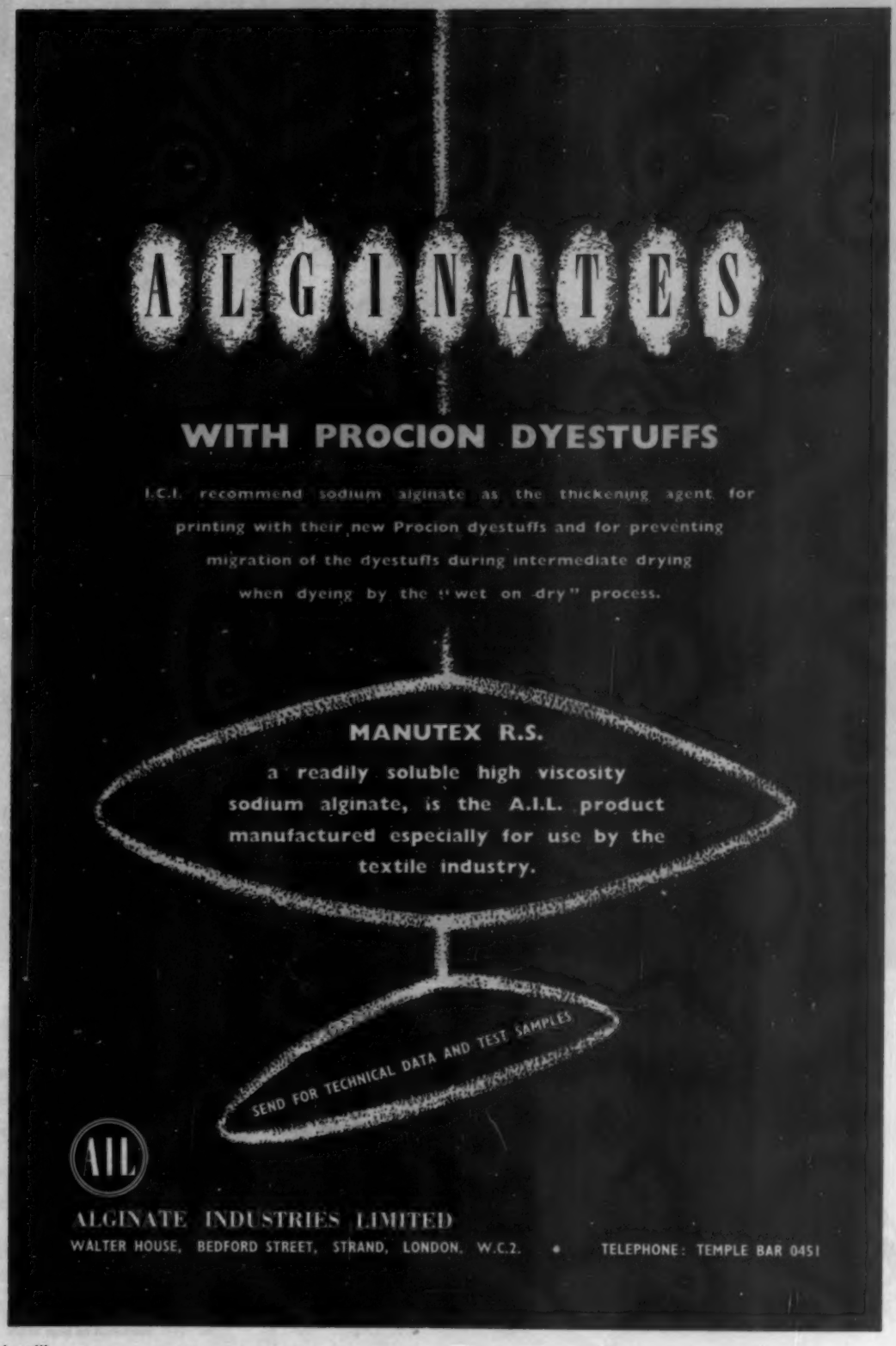
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FORTHCOMING MEETINGS OF THE SOCIETY

Wednesday, 9th January 1957

NORTHERN IRELAND SECTION. *Application of Colour Physics to Textiles.* P. H. Oliver, Esq., B.Sc., Grad.Inst.P. and J. C. Guthrie, Esq., M.Sc., F.Inst.P. (Courtaulds Ltd.). Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

Thursday, 10th January 1957

MIDLANDS SECTION. *Developments in Analytical Methods in the Dyehouse Laboratory.* R. W. Richardson, Esq., Ph.D., B.Sc., A.R.I.C. and Z. Bergmann, Esq. (Joint with the Society of Chemical Industry). Gas Theatre, **Nottingham.** 7 p.m.

WEST RIDING SECTION. *Full Shades on Secondary Acetate and "Tricel" and Allied Topics.* H. C. Olpin, Esq., M.Sc., F.R.I.C., F.S.D.C., J. Wood, Esq., B.Sc., A.R.I.C. (British Celanese Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 11th January 1957

LONDON SECTION. Ladies' Evening. *Kippers, Cocktails, Confectionery & Colour.* G. J. Chamberlin, Esq. (The Tintometer Ltd.). Royal Society, Burlington House, **London, W.1.** 6 p.m.

Monday, 14th January 1957

BRADFORD JUNIOR BRANCH. *The Use of Fading Lamps for Determining Light Fastness.* P. R. Dawson, Esq. (I.C.I. Ltd.). Technical College, **Bradford.** 7.15 p.m.

Tuesday, 15th January 1957

SCOTTISH SECTION. *Application of Colour Physics to Textiles.* J. C. Guthrie, Esq., M.Sc., F.Inst.P., F.T.I. and P. H. Oliver, Esq., B.Sc., Grad.Inst.P. (Courtaulds Ltd.). St. Enoch Hotel, **Glasgow.** (Joint Meeting with Textile Institute.) 7.15 p.m.

LEEDS JUNIOR BRANCH. *Structural Aspects of Cellulosic Fibres.* Dr. N. S. Wooding (Courtaulds Ltd.). Departmental Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds 2.** 3.30 p.m.

Friday, 18th January 1957

LONDON SECTION. Annual Dinner and Dance. Waldorf Hotel, **London W.C.2.** 7 for 7.30 p.m.

MANCHESTER SECTION. *A New Approach to the Dyeing of Hydrophobic Fibres.* D. Garrett, Esq. (I.C.I. Ltd.). Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

WEST RIDING SECTION. Ladies' Evening. Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 22nd January 1957

HUDDERSFIELD SECTION. *Application of Colour Physics to Textiles.* J. C. Guthrie, Esq., M.Sc., F.Inst.P., F.T.I. and P. H. Oliver, Esq., B.Sc., Grad.Inst.P. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 23rd January 1957

MIDLANDS SECTION. *Problems in the Processing of Rayon Blends.* R. C. Cheetham, Esq., A.M.C.T., F.R.I.C., and H. D. Edwards, Esq., Ph.D., A.R.I.C. College of Technology, **Leicester.** 7 p.m.

Tuesday, 29th January 1957

BRADFORD JUNIOR BRANCH. *The Work of a Colourist in a Man-made Fibres Dyehouse.* J. T. Lynes, Esq. (Courtaulds Ltd.). Technical College, **Bradford.** 7.15 p.m.

Thursday, 31st January 1957

WEST RIDING SECTION. Discussion, *Detergency.* Panel—R. S. Hartley, Esq., A.R.I.C. (Wool Industries Research Association), G. H. Rostron, Esq., A.R.I.C. (Joseph Crosfield & Sons Ltd.), R. C. Tarring, Esq., B.Sc., A.R.C.S. (Shell Chemicals Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 1st February 1957

LONDON SECTION. *A Review of the Colour Fastness Requirements in Dyed Textiles.* T. H. Morton, Esq., M.Sc., Ph.D., F.S.D.C. (Courtaulds Ltd.). (Joint meeting with the London Section of the Clothing Institute.) Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 5th February 1957

LEEDS JUNIOR BRANCH. *Supply, Treatment and Disposal of Water in Relation to the Dyehouse.* R. W. Richardson, Esq., B.Sc., Ph.D., A.R.I.C. (Courtaulds Ltd.). Departmental Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds 2.** 3.30 p.m.

MANCHESTER JUNIOR BRANCH. "*. . . and inwardly digest*". A Dissertation on the difficulty of assimilating Technical literature. S. Burgess, Esq., A.M.C.T., F.S.D.C. (Courtaulds Ltd., Droylsden Dyehouse). Manchester College of Science and Technology, **Manchester.** 7 p.m.

Tuesday, 12th February 1957

SCOTTISH SECTION. *Reactive Dyes—A New Approach to Cellulose Dyeing.* R. W. Speke, Esq., B.Sc. (I.C.I. Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Wednesday, 13th February 1957

NORTHERN IRELAND SECTION. *Fifty Years Dyeing Linen in Ireland.* N. McCraith, Esq., B.Sc. (Joint Meeting with Textile Institute.) Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

BRADFORD JUNIOR BRANCH. *Finishing of Garments and Fabrics made from Bulked "Terylene" Yarns and Filaments.* G. McLewy, Esq., B.Sc., Ph.D., A.R.I.C. (I.C.I. Ltd. Terylene Council). Technical College, **Bradford.** 7.15 p.m.

Thursday, 14th February 1957

WEST RIDING SECTION. *Applications of Colour Physics to Textiles.* J. C. Guthrie, Esq., M.Sc., F.Inst.P., F.T.I, P. H. Oliver, Esq., B.Sc., Grad.Inst.P. (Courtaulds Ltd.). Hotel Metropole, King Street, **Leeds.** 7.30 p.m.

Friday, 15th February 1957

MANCHESTER SECTION. *Problems in the Wet Processing of Rayon Blends.* H. D. Edwards, Esq., Ph.D., A.R.I.C and R. C. Cheetham, Esq., A.M.C.T., F.R.I.C. (Courtaulds Ltd.). Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

Tuesday, 19th February 1957

HUDDERSFIELD SECTION. *Petroleum Chemicals in the Textile Industry.* H. Bratherton, Esq., A.M.C.T., A.T.I. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 20th February 1957

MIDLANDS SECTION. *Basic Mechanisms of Winch Processing.* R. H. Waddington, Esq., B.Sc. Albert Hall Institute, **Nottingham.** 7 p.m.

Thursday, 28th February 1957

WEST RIDING SECTION. *The Applications of Fluid Beds to Dyeing.* J. Wilson, Esq., M.C., M.Sc. and F. G. Audas, Esq. (British Rayon Research Association). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 5th March 1957

LEEDS JUNIOR BRANCH. *Reactive Dyes. A New Approach to Cellulose Dyeing.* C. D. Weston, Esq. (Imperial Chemical Industries Ltd.). Departmental Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds 2.** 3.30 p.m.

MANCHESTER JUNIOR BRANCH. *The Principles and Practice of Package Dyeing.* K. Limbert, Esq. (The Longclose Engineering Co. Ltd., Leeds). Manchester College of Science and Technology, **Manchester.** 7 p.m.

continued on page xxxix

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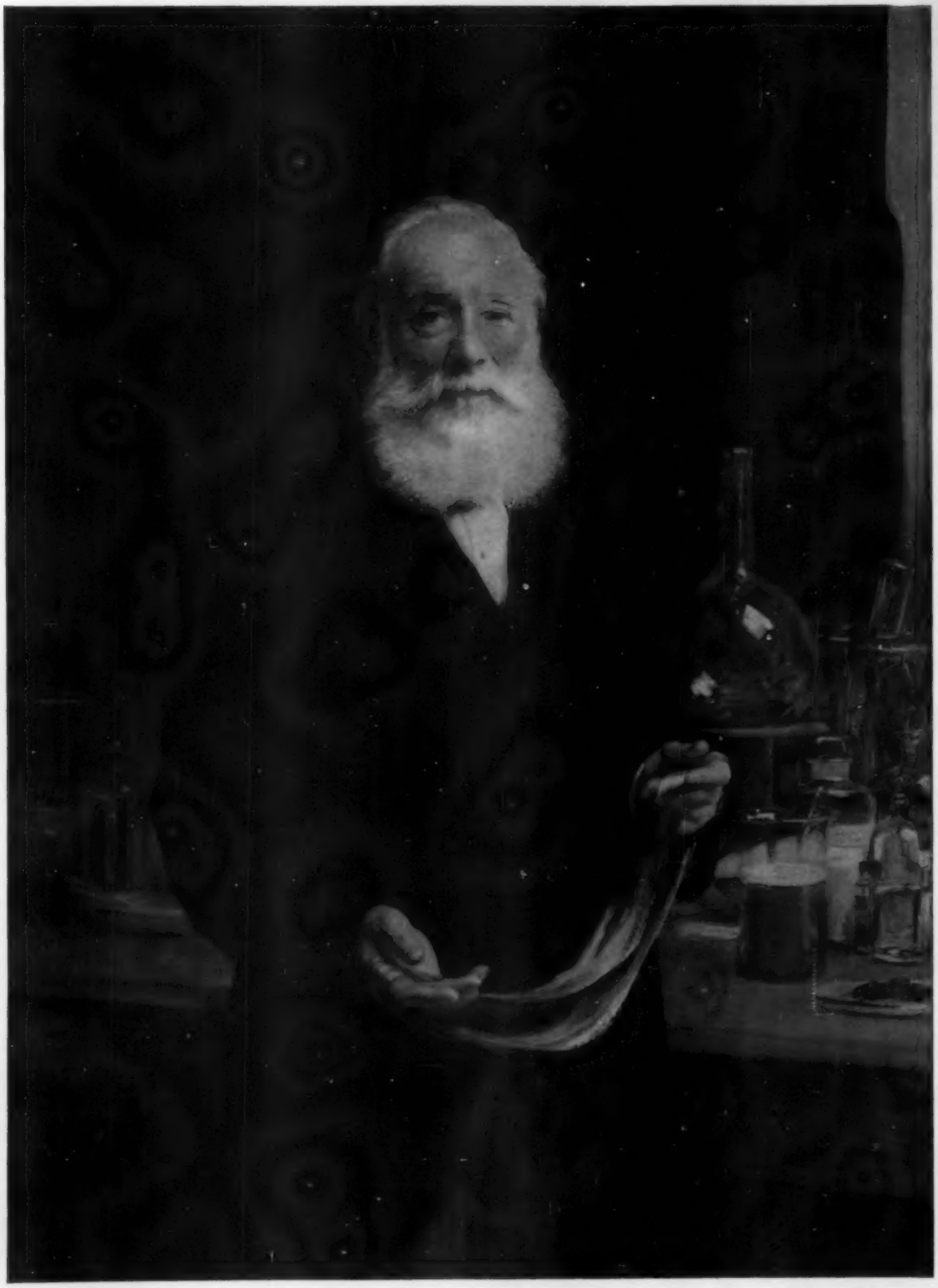

Sir WILLIAM HENRY PERKIN F.R.S.

President of the Society of Dyers and Colourists 1907

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THE JOURNAL

OF THE

Society of Dyers and Colourists

Volume 72 Number 12 DECEMBER 1956 Issued Monthly

Proceedings of the Society

Some Early Stages in the Renaissance of the British Dyemaking Industry
Tales from Turnbridge, Huddersfield, 1899–1920

C. M. WHITTAKER

Perkin Centenary Lecture of the West Riding Section given at the Victoria Hotel, Bradford, on 1st November 1956, Mr. C. W. Green in the chair

My title is specifically limited to my own personal recollections—subject to the misted memory of an old man.

The conditions when I graduated were entirely different from those of today. Chemists in dyehouses in 1899 were the exception and not beloved by the foremen dyers: they frequently held positions under very hostile conditions. Today professors in their annual departmental reports proudly give a list of posts filled by their graduates. My professor never even asked me whether I had got a job. No personnel or research director ever interviewed me: they did not exist in my youth. I was unable to ask the stock questions of today—

Have you a five-day week?

Have you a pensions scheme?

How long holidays do I get?

After Sir Milton Sharp and George Douglas had strongly advised my father to avoid the dyeing trade, Robert Holliday accepted me as a volunteer at Turnbridge. This meant no salary from August 1899 to May 1900, then a year at Berlin University, also at my father's expense.

On arrival at the works of Read Holliday & Sons Ltd. at Turnbridge, Huddersfield, in August 1899, I found it, like Caesar's Gaul, divided into three parts—Top Yard, Middle Yard, and Low Yard—with laboratories in each. I was lucky to be put under Harry Dean, who—I have no hesitation in saying—had at that time a wider knowledge of works-scale dyemaking than any other British chemist of his generation. My first lesson was in what is now grandiloquently called "chromatography", which had been routine daily procedure in the dyemaking industry for years. In 1925 I subsequently applied it to the first empirical classification of the behaviour of direct cotton dyes on viscose rayon.

The year 1899 was the time of the Boer War, and Read Hollidays started making picric acid for the War Office. Owing to this war demand the price of phenol rose from 7d. to 11d. a pound, which Read Hollidays thought outrageous. They decided to make it synthetically, and proved able to make it cheaper than the enhanced market price by caustic soda fusion of benzenemonosulphonic acid, the resulting sodium phenoxide being treated with sulphur dioxide (Read Hollidays then made sodium bisulphite for the indigo dyers) to liberate the phenol. (In 1899 the resulting sodium sulphite was dumped on the tip, but in 1914 it was all converted into hypo (sodium thiosulphate): such was the demand in 1914 that a lot of sulphite was dug up from the 1899 tip and made into hypo.) I claim that that was the first time that phenol had been made synthetically on a commercial scale in Great Britain.

This experience proved of great value to the nation in 1914, for Read Hollidays immediately resumed manufacture of phenol and picric acid on a very large scale at the outset of the First World War. A very large nitric acid plant was installed, and a large, very vulnerable and valuable stock of sodium nitrate was housed in a huge shed at Turnbridge. The know-how was also passed on to other firms.

On looking back it becomes clear that in 1899 the British dye industry had reached rock-bottom—certainly Read Hollidays had. This leads me to point out the dominant part that war has played in the renaissance. The Boer War contract for picric acid provided Hollidays with much needed funds: it was the first stage of the renaissance. The Russo-Japanese War also specifically helped Read Hollidays financially. The First World War impressed on the nation the absolute necessity of establishing a self-contained British dyemaking

industry. It was not, however, until the control of politicians and placemen had been replaced by that of chemists, physicists, and engineers that the difficult and prolonged development—much retarded by the body blow of the Sankey judgment in 1919—began which enabled the renaissance to be completed in time for the Second World War, thereby preventing a repetition of the crazy and immoral conditions in the dyemaking and dye-using industry which occurred during 1914–1918. I may add that the restrained price policy of the British dyemakers during the Second World War also created a much friendlier atmosphere between British makers and users. I started in an atmosphere of contempt: I am delighted to have lived to see this renaissance.

During the Russo-Japanese war in 1903–1904 Japan (then our ally) came to the West Riding for huge quantities of army blankets. Read Hollidays supplied large quantities of Alizadine Yellow Y, Alizadine Brown R, and Fast Chrome Black (*C.I.* 299) at a fantastic profit. At the peak of activity one dyehouse alone was dyeing 30 tons of wool a week by the top-chroming process. Each dye was reduced to half strength and sold at a uniform price of 2s. 6d. a pound. The full-strength Brown normally sold at 1s. 6d., the Yellow at 1s. 4d., and the Black at 10d.—a very handsome profit.

I did the technical servicing in many dyehouses for the khaki, during which period I had one of my most curious experiences. It was at a carpet-yarn dyehouse with two foremen dyers. I noticed that at each salting of their carpet dyeings they automatically added a spoonful of a yellow substance from a wooden box on a table. Investigation showed it to be picric acid. Do you wonder that I have been cynical about some alleged foremen dyers?

That period was the second great help to Read Hollidays' finances. In 1899 their range of manufacture was as follows—

Sulphuric, nitric, and hydrochloric acid (no fuming acids)

Benzene and toluene distilled from crude naphtha, which were mono- and di-nitrated

Aniline oil and salt, sulphanilic acid, *m*-phenylenediamine, toluylenediamine

Chrysoidine (*C.I.* 20), Bismarck Brown (*C.I.* 331), Alkali Blues, Soluble Blues

Induline (*C.I.* 860 and 861), Nigrosine (*C.I.* 864 and 865), Magenta, Cerises, etc. (*C.I.* 677), Primuline (*C.I.* 812).

From the dehydrothio-*p*-toluidine Read Hollidays made a range of direct cotton dyes called *Titan*, which were much inferior to those derived from benzidine, tolidine, etc. They had not then tumbled to making Fast Yellow (*C.I.* 814), but sold their surplus dehydrothio-*p*-toluidine to Leopold Cassella & Co., who must have been highly amused at our naïveté. Naphthol Yellow (*C.I.* 10), Acid Oranges (*C.I.* 143 and 151), Cardinal Red J (*C.I.* 176), Acid Bordeaux B (*C.I.* 88), and Blacks were also made from imported intermediates. No mordant dyes were made in 1899 except the Gambines (*C.I.* 2–4), which failed owing to their sensitivity to iron. Read Hollidays had bought Schützenberger and Lalande's hydrosulphite indigo vat patent rights[1] of 1871 and supplied ready-reduced natural indigo with hydrosulphite produced from bisulphite (Hydros in powder form was yet to come). Synthetic indigo slowly and irrevocably killed that trade, but it was still supplied for Government contracts, which up to 1914 stipulated the use of natural indigo in India's interests. Read Hollidays also at that time made sodium nitrite by Dr. L. G. Paul's patent[2] of carefully feeding sulphur into fused sodium nitrate and caustic soda, and then separating the sodium nitrite and sodium sulphate by crystallisation. The electric process subsequently made this uneconomic, but in 1899 sodium nitrite was being supplied to Germany, probably in exchange for dyes. The firm also made its own ice.

Read Hollidays had several Continental chemists on their staff. Dr. I. Petraczek was responsible for the erection of the very efficient distillation, nitration, and aniline-oil plants. He was an early chemical engineer. To us juniors he was known as the "German Emperor". He left to take up a partnership with Christopher Rawson in Bradford as consulting chemists. Owing to there being no Primuline (*C.I.* 812) patent, Read Hollidays were very quick in making it after Green's discovery. Dr. Elbel, a German, who learnt to make Primuline at Turnbridge, took the process to Kalle & Co. AG. Dr. H. Seidel joined the Aktien-Gesellschaft für Anilin-Fabrikation (Agfa, then known in English as the "Berlin Aniline Co. Ltd.") from Turnbridge and within six months brought out Columbia Black FF extra (*C.I.* 539) in 1898; one suspected that it had been discovered at Turnbridge. Sir Gilbert Morgan was at Turnbridge in his youth. In my time Dr. W. Thévenaz came from Switzerland and set up a plant for Methylene Blue (*C.I.* 922) and Auramine (*C.I.* 655). Dr. Badier came from France and made Methyl Violet (*C.I.* 680) and Malachite Green (*C.I.* 657) when the "Industrial Alcohol Act" was passed (1906). Dr. Belart had a short stay, then set up a firm for making sizes in Huddersfield.

In my contacts chemists who made basic dyes and natural silk dyers were all obstinate obscurantists of the first order. None would have another chemist near him.

In 1899 Read Hollidays had diversified activities: they made electric dynamos; they made complete acetylene-gas installations; they made their own calcium carbide. They ran a dyehouse for the azoic process (Vac Red, *C.I.* 93), which they had patented[3] in 1880 (today it would have been licensed on a royalty basis, to their much greater profit), but Para Red (*C.I.* 44) killed it. The dyehouse was naturally a sore point with other dyers, and was detrimental to dye sales. Mr. Robert Holliday died in 1901. Mr. (later Sir) Joseph Turner was made manager in conjunction with Mr. (later Major) L. B. Holliday, then in his early twenties: this was the start of the renaissance. The dynamo shop and the acetylene activities were

immediately stopped*. All energies were concentrated on dye manufacture, save that the dyehouse lingered on a few years, till it was gutted for the installation of the first Passberg drying stoves in the plant modernisation. From that day Read Hollidays climbed steadily out of near-bankruptcy into prosperity. Chemical staff was increased, plant modernised and extended, and a dividend of 10% achieved.

Nobody who was not in the dyemaking industry before 1914 has ever experienced the competition which existed then: no holds were barred. I sincerely hope that it will never be repeated. The German, the Swiss, and the much smaller British firms were in deadly cut-throat competition. There was no Dyestuffs Act, no dyestuff cartel. Yet Read Hollidays always paid their preference dividend, paid 5% on the ordinary shares from 1906, increased it to 10% in 1909, and maintained 10% till absorbed in 1915 into British Dyes Ltd. I am proud to have been a humble participant in that wonderful record in those competitive circumstances. It kept one on one's toes: one lived largely on one's wits. Read Hollidays thus provided logically one of the foundation stones on which the complete renaissance of the British dye industry has been built.

When I returned from Berlin in 1901 H. Bindschaedler, a Swiss chemist, who had been in charge of the then modest dyeing laboratories, had taken up a partnership in a commercial dyehouse. I was put in his place—a complete greenhorn who had never even been taught how to match a shade at Leeds. There were no amenities—no canteen with subsidised meals; inadequate sanitary arrangements; one stood all day even to write; one split one's own hanks by hand; no mechanical drying stoves; no vacuum; no compressed-air supply; no typists; no reports in sextuplicate (the industry did not then consume the paper it does today); only the Dufton–Gardner daylight lamp, very inefficient compared with those of today; a fading lamp consisting of a naked arc-lamp, with planoconvex and double-convex lenses about 9 in. in diameter concentrating the light on a small holder capable of taking only one pattern and the standard (if it was a fast-dyed wool pattern, the heat usually charred the wool before it had faded). My starting salary was £130 per annum, so again you see how lucky the young generation is today. Woolwich Arsenal as late as 1914 advertised for university graduates at £2 0s. 6d. per week. On reading Carl von Duisberg's autobiography, I was much consoled to learn that his starting salary was only £5 per annum more than mine.

In my youth we had no money, but we had much more fun than you seem to have today. I have never regretted it. We had one very great advantage. The unavoidable result of today's big organisations is the division into narrow, watertight sections. We of my generation were jacks-of-all-trades, and in my subsequent life I have found my all-round training a great advantage. In my opinion big industry today could usefully blend some jacks-of-all-trades with its narrow specialists. This would at any rate reduce the size of some technical service deputations and conferences.

In preparing this address I have been struck by the similar conditions obtaining in our industry on my entrance in 1899 and on my exit in 1950. On both occasions a technical revolution and an expansion were taking place. On my exit—the new hydrophobic synthetic fibres were compelling the new technique of high-pressure and high-temperature dyeing (the latest Procion (ICI) dyes are applied lukewarm—the very opposite of the high-temperature technique); the enormous extension of the use of pigments for coloration; the molten-metal machine; the modified crease-resist process; the Everglaze finishes; the new silicone finishes; the no-ironing stunt; the new detergents; the molten-urea process; and the solvent dyeing of wool. On my entry in 1899—Columbia Black FF extra (*C.I.* 539), the first direct cotton black, had just been introduced; Sulphur Black T extra (*C.I.* 978) in 1900 followed by the early Sulphur Browns and Blues; Metachrome Mordant and Brown B (*C.I.* 101) in 1900; Indanthrene (*C.I.* 1106) and Flavanthrene (*C.I.* 1118) in 1901; the fight of synthetic indigo against the natural-indigo interests. The dyer was asking for pure acid dyes so that mercerised cotton stripes would remain unsullied in wool piece dyeing. This demand established the dominance of Blue Black base (*C.I.* 246) over the earlier favourite Naphthylamine Black D (*C.I.* 308). Silk effect threads immunised in strong tannic acid baths, and then fixed with tin salts, were in demand. Ramie was making another effort to be used as a textile, and the ever recurring effort was being made to produce worthwhile effects from the difference in affinity of chlorinated and non-chlorinated wool. Truly, both vintage periods in our industry.

The Vidal Sulphur Blacks (*C.I.* 973) from *p*-aminophenol had poor substantivity, were difficult to dye owing to their susceptibility to oxidation, and had to be chromed to develop the shade. Read Hollidays made a very good Vidal-type black, and in 1901 I became involved in technical servicing, mainly in the Colne Valley and Holme Valley districts. Vidal was a vivid Gallic personality, but never seemed to reap much financial reward from his basic invention. He was frequently at Turnbridge. In his later life he turned his attention to fur dyeing. I saw him last in 1913 in the East End of London. The dinitrophenol Sulphur Blacks quite properly swept Vidal Blacks off the market, since they were much more substantive and did not require chroming. Read Hollidays and Levinstein Ltd. were both sued by the Berlin Aniline Co. for Sulphur Black T (*C.I.* 978) patent infringement. The successful defence was lack of description. The final decision was given on 20th March 1914, in favour of the English firms.

Another decisive early stage in the renaissance was reached when Read Hollidays completed

* Ernest Brook ran the dynamo shop. He recently died at the age of 82. He started on his own in a single room with a capital of £300, and his firm had a turnover of £4,500,000 in the year of his death.

arrangements with the United Alkali Co. to monochlorinate its benzene, which was converted into chlorodinitrobenzene at Turnbridge. From then Hollidays were really competitive in Sulphur Black and erected a large and efficient plant. It was of vital advantage when the First World War broke out.

Vidal Blacks were never applied to pieces, but the green-shade dinitrophenol Sulphur Black (*C.I.* 998) has always been. In 1903 Read Hollidays made their first experiments on cotton pieces on an ordinary Lancashire jigger (no nip rollers) in their own dyehouse. I subsequently dyed cotton italians successfully in the Renton dyehouse of the United Turkey Red Co. Ltd., probably the first pieces to be so dyed in Scotland. Read Hollidays followed this up by obtaining their first Sulphur Black contract from the Bradford Dyers' Association Ltd. That was a red-letter day for Read Hollidays. You can imagine the care devoted to standardising the first delivery. At the time Mr. Joseph Turner allowed me to standardise only the union dyes and the fakes I will describe in a few minutes, but he asked me to check this first delivery. Much to his amazement, I said that it was 15% strong. He put in the extra salt, and the contract was confirmed. For saving 15% on a 100-ton contract I was not even thanked, let alone rewarded.

Let me anticipate the First World War for a moment. The pressure for Sulphur Black was then so great that in late 1914 customers waited with their own carts at the works gates and accepted deliveries of unground, untested Sulphur Black lumps as they were knocked hot out of the drying-stove trays. Like many emergency steps it was most extravagant, because the lumps rapidly decomposed, became acid, and lost strength, whilst some casks actually burst into flames in the dyehouses. From this decomposition free sulphur collected in the dyebaths in excessive amounts, so that a leaflet recommending the use of sodium sulphite to dissolve the free sulphur had to be attached to each advice note and invoice. Many dyers then thought that free sulphur meant subsequent tendering. When pressure of war work compelled Mr. Joseph Turner belatedly and very unwillingly to give me complete control of the standardising, by quick handling of the Sulphur Black batches I sent up the yield 12·5%, and the production chemist nearly kissed me. Read Hollidays had three mill sheds, and I turned out 300,000 lb. of dyes of all classes a month in those days. Users had evidently talked to Sir James Falconer (a Scottish M.P. who had been appointed chairman of British Dyes Ltd.) about the poor colour standardisation of the British firms, because he talked to me about it. I bluntly told him that it was more a question of honesty than of skill.

Another stage in the renaissance of the British dyemaking industry was the passing of the "Industrial Alcohol Act" (the Revenue Act 1906). Immediately it was permissible to denature methyl alcohol with aniline oil Read Hollidays installed four German-made autoclaves for a dimethylaniline plant and made Methyl Violet (*C.I.* 680) and Malachite Green (*C.I.* 657). In 1914 Hollidays' range of basic dyes included Auramine (*C.I.* 655), Chrysoidine (*C.I.* 20), Bismarck Brown (*C.I.* 331), Magenta and Cerise (*C.I.* 677), Methylene Blue (*C.I.* 922), Methyl Violet (*C.I.* 680), and Malachite Green (*C.I.* 657)— not a bad range for a small firm. On the outbreak of war the Admiralty commandeered the dimethylaniline plant, since it was from this that the then detonator for torpedo heads, tetranitroaniline, was made. The Admiralty immediately ordered the plant to be extended by twelve autoclaves. It was the first new plant of top priority to be erected at Turnbridge after the outbreak of war, save possibly the nitric acid and salicylic acid plants. Since no autoclaves had at that time been made in Britain, you can imagine that there were fun and games before satisfactory ones were produced.

I have already said that Dr. H. Seidel, who patented Columbia Black FF (*C.I.* 539), was once at Turnbridge. He had eventually to retire from the industry owing to nitrous acid poisoning. On retirement— possibly as *amende honorable*— he came back to Turnbridge and started up a Columbia Black plant. An efficient new plant was erected. This I view as another early stage in the renaissance. Direct Black EW (*C.I.* 582) was made in large quantities on this same plant when it seemed to be preferred to Columbia Black.

Meantime many other direct cotton dyes had been produced: Chlorazol Drab RH was outstanding. A full range of pattern cards and a dyeing manual and handbook had also been issued by me in which I had the nerve to tell dyers to mix their dyes with brains. In our mordant dye range Anthracene Brown (*C.I.* 1035) had been made since 1905 from imported intermediates, and a regular trade had been built up in Scotland and the West of England. It had to cease, of course, in 1914. Gallocyanine (*C.I.* 883) and Anthracene Blue WG (*C.I.* 1059) also were made. Meantime a pre-war trade had been built up in Alizadine Brown M (*C.I.* 101), obtained from intermediates made at Turnbridge. In 1914 this combination was, of course, made by numerous firms, mushroom and otherwise, which ensured the supply of army uniforms.

It is interesting to note that the West of England and the Tweed district had ignored the metachrome process. The cutting-off of Anthracene Brown (*C.I.* 1035) in 1914 compelled hasty adoption of the process, and Anthracene Brown appears to have faded completely out of the picture. Read Hollidays were frequently, and with some justification, described as colour fakers, not colour makers. Actually they were both. In view of the recently developed metal-complex dyes for wool, I am proud to recall that I put on the market in 1903 as Mercerol Colours a range of mordant dyes plus a specially prepared chromium salt ground with the dye. It did not precipitate the dyes in solution, and they could be applied in the same manner as aggregated acid dyes e.g. 4, the resulting dyeings being as fast to light and milling as if they had been top-chromed. The salt was a mixture of potassium dichromate and oxalic acid. The first lot was being

ground in an enclosed mill, but the labourer came and said that it "puffed". Fortunately I had the sense to stop the mill, or there would have been an explosion. The separately powdered dichromate and oxalic acid were subsequently mixed with the aid of wooden shovels on an open steam-heated jack. The jack warmed up, and the dry mixture was moistened at one end, when a vigorous reaction spread over the mass, at the end of which it could be safely ground with the dyes. In addition to chromium salts copper and zinc sulphates were used. Alizarin Orange SW (*C.I.* 1033) with zinc sulphate gives a terracotta red extraordinarily fast to light and milling, which was on the market in 1904 as Mercerine Wool Red Y. The monoazo dye from *o*-aminophenolsulphonic acid coupled with Nevile and Winther's acid plus cupric sulphate gave the fastest-to-light Acid Red that I have personally tested. It was on the market as Fast Acid Red RH in 1911. It was quickly followed by a Fast Acid Bordeaux RH and a Fast Acid Brown RH on similar lines. Is it too conceited of me to say that the above dyes were the forerunners of the modern metal-complex dyes? In the hectic period of the formation of the British Dyestuffs Corporation Ltd., with all its personal jealousies, many of Read Hollidays' profitable fakes were ignored— or were they too much in advance of their time?

Read Hollidays could buy from the Continent as much H acid, γ acid, and R salt as they wished, but they could never buy sky acid (2S (Chicago) acid) and therefore could never make Sky Blue FF (*C.I.* 518), a very important dye before 1914. This is how that problem was partially dealt with. Hollidays had a pre-1900 patent [5] for Titan Como (*C.I.* 710) (from Pararosaniline and β-naphthylamine). When dyed from an acetic-acid bath on cotton it gave a brilliant bright blue of poor fastness to light and washing. Chlorazol Blue 6G (*C.I.* 520) (from dianisidine and H acid) was always made but of course was much duller than Sky Blue FF. Sufficient Titan Como was therefore added to this blue to make the mixture definitely brighter than FF, which at that period was the brightest direct cotton blue. Sufficient oxalic acid was ground in to develop the Titan Como, and the use of soda ash in the dyebath was banned. The product was marketed as Chlorazol Brilliant Blue 8B in 1904, and was very successful. It pin-pricked both Cassella and the Berlin Aniline Co. badly, and ultimately led the former to market Titan Comos as Isamine Blues. Farbenfabriken vormals Friedrich Bayer & Co. also marketed them as Brilliant Sky Blues.

Zambesi Black D when dyed as a direct pale grey fades on the green tone; Titan Black FF (*C.I.* 539) dyed as a pale grey fades on the red tone. By judicious balancing one can make a grey which fades on tone and appears much faster to light. Tons of this— at a profit of 4d. a pound— were sold in competition with the then favourite Benzo Fast Grey BL. There were no man-made fibre blends to plague one at that time.

This is an appropriate place to confess what I consider to be my biggest mistake. Before the successful development of Ciba Blues (*C.I.* 1183–1185), Antonio Sansone, a well known dye chemist of his generation, offered Read Hollidays brominated natural indigo. I was deputed to examine the offer, and I rejected it.

I had made a very detailed study of the behaviour of the available dyes for wool–cotton mixed fabrics. By 1913 I had worked up an annual sale of 178,000 lb. of union dyes, of which 110,000 lb. was Union Black V, with which Pullars' business was taken from Cassella. Nearly every garment dyer in Scotland used Union Black V, while not a single garment dyer in England would look at it: a very curious geographical division and a tribute to the then influence of Pullars in Scotland. This black was a six-dye mixing, of which, you will smile to hear, one-fifth by weight was Acid Violet 6B (*C.I.* 717) of the Badische Anilin- und Soda-Fabrik, the other five dyes being made by Read Hollidays.

A few years before 1914 Read Hollidays set up a successful selling office, laboratory, and warehouse in Leipzig. Now I will tell you the most fantastic fake sold by us. If a weak solution of hypo (sodium thiosulphate) is padded and dried on cotton pieces dyed with certain direct dyes, they are faster to light until washed. Hollidays sold hypo in Germany for this purpose as Fastogene, at a fancy price.

I hope that I have convinced you that Read Hollidays in 1914 were a prosperous unit— very small, of course, in comparison with the Continental firms— but they had a much improved and growing reputation. More chemists were engaged, and plant was being continually extended and modernised. A large suite of offices and a new warehouse were opened in 1913, and these proved a godsend to the Board of British Dyes Ltd. as a home when they took possession in 1915. It may be interesting to interpolate here that Carl von Weinberg of Cassella was at Turnbridge in late 1913 and early 1914 negotiating for the purchase of the works. It is an interesting speculation what influence, if the sale had been completed, it might have had on the subsequent renaissance of the British dyemaking industry. The cessation of the supply of German dyes caused by the First World War resulted in a panic and a demoralisation which beggar description, whilst for some individuals it was really tragic in its effect. Hysterical people reported to the Huddersfield police that my light-exposure patterns on a farm barn roof were a signal to the Germans, and I was compelled to take them down. One representative of a German dye firm went round Dundee saying that Read Hollidays would shut down within a month. I could talk for hours on the fantastic state which developed. I propose only to deal with a few salient points.

The fundamental fact then was that dye-users had imported 90% of their requirements. Nowadays, thanks to the renaissance, this proportion is produced domestically. What a splendid achievement!

The period of the First World War was a severe moral testing time for all the staff in the British dyemaking industry. One became a little tin-god

on wheels overnight: one was fawned on from all sides, and it is not to be wondered at that some fell by the wayside. I was on holiday on 4th August 1914, but returned to Huddersfield immediately. I went straight to Mr. Turner and said that, whatever else he made, he must make salicylic acid for a mordant yellow for khaki on wool. It was actually the first new intermediate made at Turnbridge.

It was fortunate for dye-users that Read Hollidays and Levinsteins, though fierce competitors, were complementary in their intermediate products. Hollidays were active in the benzene–toluene field; Levinsteins in the naphthalene field. Exchanges of intermediates were immediately arranged to their mutual benefit.

It is amazing to recall that Anthracene Brown (MLB) (*C.I.* 1035) was specified by the War Office for wool khaki uniforms in 1914. The war, of course, made nonsense of this piece of official lunacy.

For khaki on wool Read Hollidays supplied Khaki Yellow W, Khaki Brown W (*C.I.* 101), and Khaki Green W (*C.I.* 108), all in paste form and at half-strength compared with standard pre-war types. I standardised them in 14,000-lb. batches. These supplies, together with those from Levinsteins, Brotherton & Co. Ltd., and other makers, fully met the demand. The Navy's requirements for uniforms were covered by Coomassie Navy Blue (*C.I.* 530) of Levinsteins and by their subsequent operation of the Ellesmere Port indigo plant. I have frequently said, and I repeat again, that the then small British dyemakers have never been given proper credit for the competent way in which they fulfilled the demand for dyes for the uniforms of the British and some of their Allies in the First World War. The shortage of dyes was such that the prices obtainable made it frequently more profitable for a dyer to sell his actual dye stock rather than use it. It was known to us in Huddersfield that one dyeing group made £80,000 in one year by buying and selling dyes. I know for certain that 90s. 0d. a pound was paid during the war in this very city for Chicago Blue 6B (*C.I.* 518) costing 10d. in 1913. A 120-lb. keg of Patent Blue V (*C.I.* 712) sold for £450 to dye the horizon blue of the French Air Force. Mushroom dealers sprang up overnight, and we in Huddersfield knew in many cases for which dyehouses they were selling. Subsequent indiscreet talk in Bradford hotel lounges overheard by Inland Revenue scouts started a chain reaction of investigation into their books, so that some of the profits of this spivery were ultimately recovered.

It must be remembered that the First World War broke out on 4th August 1914, but that the prospectus of British Dyes Ltd. was not issued until 5th March 1915. The initial subscriptions were so small that it was at first doubted whether allotment would be made. Meantime Read Hollidays had made big extensions at Turnbridge, out of which new sheds first came H acid. The inevitable shortage of dyes naturally became the subject of political and Press discussions. The Dyewares Supply Enquiry Committee of our own Society on 23rd December 1914 published the following absurd platitude: "that the directors nominated by the Government should not only be men of generally acknowledged business ability but that the majority should also possess a technical and scientific knowledge of the industry". Surely they must have known that men with such qualifications were non-existent outside the then small staffs of the British firms. As usual when the Press deals with a scientific subject, a lot of nonsensical matter was published. Owing to the smallness of the British industry, only a very limited number of people had any detailed knowledge of its many complications. In those days the industry had not the connections with the universities which are so intimate today. The *Manchester Guardian* in 1915 was severely critical. It said: "Existing dyestuff establishments are not really the best organisations to take a bold expansive move *even in their own sphere:* some of the general chemical manufacturers would probably be better by virtue of their greater technical versatility". Professor Henry Armstrong said that the national effort savoured absolutely of comic opera. Professor Pope reported: "The Government organisation has proved to be not only a great failure but has had the further effect of inhibiting the re-establishment of the coal-tar colour industry". Pope was in Australia in 1914 according to Professor Dodds. His return was delayed and he was again held up in India. To my knowledge he was never round the Huddersfield works, so on what evidence did he express so drastic and false an opinion?

Plato wrote in 350 B.C.: "All politicians are insincere". If he had lived in Britain in 1914–1920 I think that he would have used a stronger adjective.

Three major problems faced the Board of British Dyes Ltd.—

(1) Lack of intermediates and shortage of oleum

(2) Explosives and dyes, equally vital, required the same basic chemicals—all in short supply

(3) Which firms to absorb and where to build new works.

Amidst a volley of criticism Read Hollidays were chosen. On financial grounds the choice was perfectly obvious. After much discussion the Dalton site was chosen for the new works. The initial works plan was based on the Leverkusen lay-out. β-Naphthol was the first intermediate ex Dalton; the first dye was Lake Red P (*C.I.* 158) for the Post Office for their 1d. stamps. Much of the new plant for azo dyes was commandeered for washing trinitrotoluene (T.N.T.).

Plants for fuming acid and for acid concentration were installed. Both proved very troublesome. The platinum catalyst was always getting poisoned, until a Cottrell precipitator was installed. Many pairs of curtains in the neighbourhood had to be replaced. Herbert Robson eventually took charge, to the very great advantage of both plants. Research laboratories were built at Dalton with Sir Gilbert Morgan as non-resident research controller; he soon left to accept the Chair of

Chemistry at Birmingham, and then became Director of the Chemical Research Laboratory at Teddington. Sir Robert Robinson followed, but after a short stay at Dalton he succeeded W. H. Perkin, Junior, first at Manchester, subsequently at Oxford.

We hear a great deal about redundancy today. After the Armistice in 1918 the British Dyes, Huddersfield, staff had a dinner–dance on a Friday evening, during which a bombastic speech told them that they had helped to win the war. On the Saturday morning over fifty chemists got the sack.

Meantime, criticism by dye-starved dye-users became more and more strident. On 8th October 1915 Sir Henry Allen, of the Bleachers Association Ltd., was made chairman of a committee of prominent dye-users. This developed on 25th February 1919 into the Colour Users Association (C.U.A.). With the support of the Government they pressed for the amalgamation of British Dyes Ltd. and Levinstein Ltd., who had meantime absorbed Claus & Rée and the indigo plant at Ellesmere Port. The Board of British Dyes dissented, but were outvoted by their shareholders, so they resigned *en bloc* except Dr. M. O. Forster: he was left in an anomalous position, until he resolved it by taking an academic post in India, becoming Director of the Indian Institute of Science at Bangalore on the recommendation of Sir William Pope. This resulted in the formation of the British Dyestuffs Corporation Ltd. on 23rd May 1919 with Lord Moulton as chairman and Sir Joseph Turner and Dr. Herbert Levinstein as joint managing directors with a board of directors who knew nothing about the technique of dye manufacture. Read Hollidays and Levinsteins had been bitter competitors over my nineteen years in the industry. It can be imagined that an amalgamation of two such old antagonists could not be smooth with two men for every top job. The climax came at a meeting of B.D.C. shareholders held in Manchester in 1921, after Dr. H. Levinstein had just previously resigned, when Sir Joseph Turner was not re-elected to the Board. Eighteen months before this climax I had decided that my position of being responsible to two incompatibles was impossible, so I had started negotiations with Mr. Samuel Courtauld in the autumn of 1919, which on completion enabled me to give notice and to cross the Rubicon from dyemaking to dye-using. I left Turnbridge on 31st March 1920 loaded with presents and good wishes.

> Not heaven itself over the past hath power
> But what has been, has been, and I have had my hour.
> (*Dryden*)

My final word is to commend my guiding star to you all: "Nothing is more calculated to shock than common sense applied to long-established but unexamined beliefs". One long-established but unexamined belief which I blew up in 1921 was that mercerised cotton and viscose rayon should be dyed at low temperatures.

MORITURUS VOS SALUTO

1 WEAPONNESS PARK
SCARBOROUGH

(*MS. received 17th September 1956*)

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COMMUNICATIONS

In the Footsteps of Perkin

W. H. CLIFFE

It is less easy to make Perkin's Mauve than may be supposed. With little more than the original patent specification as a guide, yet with all the facilities of modern laboratories, chemists of 1956 have experienced difficulty in preparing on a small scale Mauve equal in quality to that which Perkin & Sons manufactured almost a century ago.

The centenary of Perkin's discovery of Mauve can hardly be said to have taken dye chemists by surprise. William Henry Perkin and what he accomplished in the eighteen years which followed 1856 have been more or less familiar to most of us almost from the days when our own makeshift laboratories were mute witnesses of our inglorious and unrecorded failures.

We know much of Perkin the man, but as we pay tribute in one way or another to the founder of our own particular empire we may reflect that we know very little about the actual discovery of Mauve and still less about its manufacture. The human aspects of those anxious days of a century ago are lost to us for ever. There is no reason why they should have been recorded, but can it be supposed that Perkin's quiet confidence in his ultimate success never faltered? Did Perkin's father, standing on the Greenford Green site during those June days of 1857 and watching the transmutation of his modest capital into bricks and mortar, sometimes wonder whether he would ever see a penny of it returned?

These may be profitless speculations without hope of answer, but it is a thousand pities that no records of any kind seem to have survived. Indeed, material evidence of the very existence of Perkin & Sons' works is startlingly small. It is less surprising that the old buildings have been torn down and that the site has been developed for modern industrial use than that no single document remains to tell us how Mauve was manufactured, in what quantity, to whom it was sold, and at what price. May these words be seen by someone who can deny them!*

So, then, after the lapse of nearly a century, it is

* Since the above was written, fresh papers have come to light, the information in which I hope to publish at a later date.

scarcely possible to say more than that Perkin & Sons purchased a raw material that was substantially benzene and obtained from it something that was substantially nitrobenzene, which was reduced to something that was for the most part aniline. The crude aniline was then converted into the sulphate, the nature of which is by no means clear, and oxidised with an unspecified amount of potassium dichromate. The only generally known description of this last process is to be found in a document [1] which today would hardly succeed in getting past the door of the Patent Office.

We know, as did Perkin in later years, that the aniline he used contained toluidines, but to what extent we can only guess. Perhaps the toluidine content varied rather widely and perhaps it did not greatly matter. Perkin & Sons probably never boasted a standardising department, and off-shade batches could perhaps have been dismissed with an easy tolerance beyond the wildest dreams of a modern works chemist. Yet this may be an ill-deserved judgment, for it has recently been stated [2] that, preparatory to redevelopment of the Greenford Green site, the excavators' shovels uncovered masses of mauve-coloured jelly. Perhaps, after all, Perkin & Sons acknowledged their failures and quietly buried them. Another dream of the works chemist!

It does seem, however, that "Aniline Purple", as Mauve was originally called, designated a dye which coloured fabrics in shades conforming to no very well defined standard. Perkin himself wrote [3]: "By using aniline containing much larger quantities of toluidine a redder colouring matter was obtained. By taking advantage of this two different products were manufactured, namely a blue shade of mauve prepared from aniline containing but little toluidine, and a red shade from aniline containing large quantities of toluidine."

Thus when we decided to match our skill against that of the youthful Perkin and to make a sample of his Mauve, we embarked on the task more as a joyous adventure than as a repetition of a soundly based and well documented chemical preparation. How soon was the joy to disappear! With the caution of those who had learnt to read before leaping, we studied the historic patent specification (Fig. 1). As we pored over the alleged structural formula of Mauve we marvelled that such a curious edifice should somehow have fashioned itself from such simple bricks. We set down that well remembered equation interpreting the action of sulphuric acid on potassium dichromate, and fancied that we could see it mirrored in those vague sentences in the patent specification.

But in the end we were driven to suspect that cheerful abandon was as likely to lead us to our journey's end as scientific reason. Nevertheless, we could not face with equanimity a charge of lack of method, but it was all too evident that only by determination could we avoid finding ourselves committed to a long research to provide answers to all the questions posed.

We first required "a cold solution of sulphate of aniline", and, almost without a thought, we began to prepare the usual half-sulphate $(C_6H_5{\cdot}NH_2)_2,H_2SO_4$. Then we began to doubt. Was this what Perkin used, or did he choose the acid sulphate, $C_6H_5{\cdot}NH_2,H_2SO_4$? Reluctantly we turned again to the literature to discover what meaning was attached to "sulphate of aniline" about 1856. After consulting long-forgotten textbooks and some of those early patent specifications dedicated to the glory of colour and fired by the example of Perkin, we came to the conclusion that the pioneers were themselves not always certain. On the whole, however, it seemed likely that the half-sulphate was used. It transpired later that our doubts were not unreasonable.

Next we gave some thought to the quality of the aniline to be oxidised. It was finally decided that a mixture of aniline (2 mol.) and *o*- and *p*-toluidines (1 mol. each) was as likely to give what was required as any other.

Then came the question of how much potassium dichromate. We felt on fairly secure ground here, for Perkin's patent clearly, if not quaintly, demanded "a cold solution of a soluble bichromate as contains base enough to convert the sulphuric acid . . . into a neutral sulphate". This was a matter of a simple chemical equation and a moment's calculation.

We had not long to wait for our reward, for the expected black precipitate was soon in evidence, and by next morning the reaction was clearly at an end.

After filtering off the product we were somewhat surprised to find that treatment of the filtrate with a second and similar proportion of dichromate afforded a second and like amount of black precipitate. So much for our equation! The combined products were washed and dried, after which we felt well on the way to our sample of Mauve.

The next stage was the extraction of the resinous impurity by boiling the black powder with benzene. The filtered benzene solution possessed an encouraging deep rich brown colour, but as one extraction followed another without sensible diminution in colour, we thought with reverence and wonder of those Easter days of 1856. Fortunately we had one tool denied to the youthful Perkin—a Soxhlet extraction apparatus. Our preparation was on no mean and niggardly scale: extraction in this way implied an apparatus of noble proportions, but the Glass-blowing Room was fully equal to the occasion. With an improvised thimble from a sheet of filter paper our impressive apparatus functioned in a manner worthy of its maker. Even so, several days and nights were required before we were satisfied of the removal of all resinous brown impurity.

The solvent was then changed for ethanol, and our troubles at last seemed behind us with our first glimpse of a deep purple solution. Here again, however, several days were needed to complete the extraction, but at length, with no little pride and satisfaction, we were able to exhibit a bottle labelled "Mauve 1956". But pride was as short-lived as any moralist could desire. We discovered that our Mauve, even when purified, dyed silk in shades which were much bluer and duller than

[Third Edition.]

A.D. 1856, 26th *August.* N° 1984.

Dyeing Fabrics.

LETTERS PATENT to William Henry Perkin, of King David Fort, in the Parish of Saint George in the East, in the County of Middlesex, Chemist, for the Invention of "PRODUCING A NEW COLORING MATTER FOR DYEING WITH A LILAC OR PURPLE COLOR STUFFS OF SILK, COTTON, WOOL, OR OTHER MATERIALS."

Sealed the 20th February 1857, and dated the 26th August 1856.

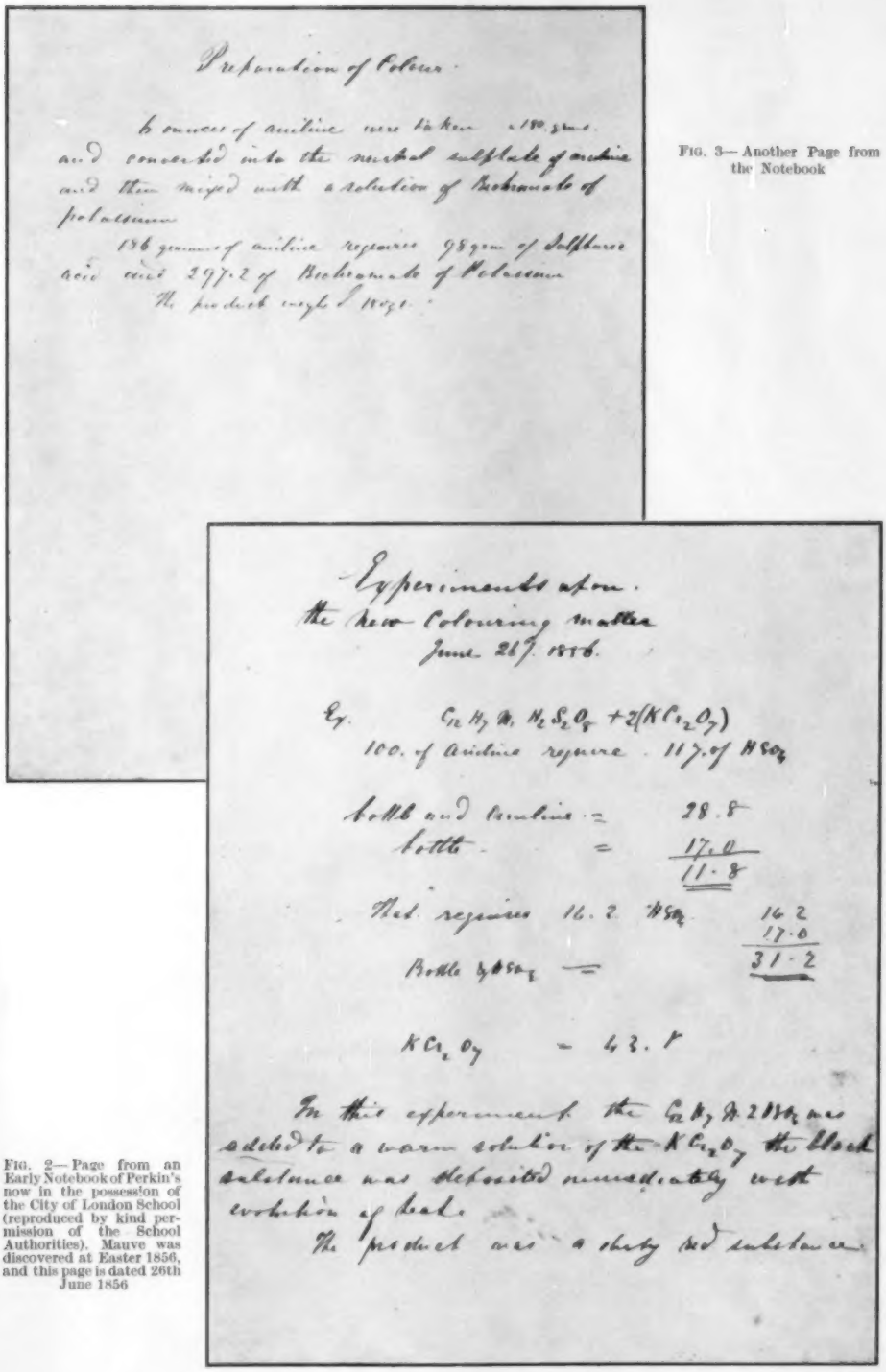
PROVISIONAL SPECIFICATION left by the said William Henry Perkin at the Office of the Commissioners of Patents, with his Petition, on the 26th August 1856.

I, WILLIAM HENRY PERKIN, do hereby declare the nature of the said Invention for "PRODUCING A NEW COLORING MATTER FOR DYEING WITH A LILAC OR PURPLE COLOR STUFFS OF SILK, COTTON, WOOL, OR OTHER MATERIALS," to be as follows:—

Equivalent proportions of sulphate of aniline and bichromate of potassa are to be dissolved in separate portions of hot water, and, when dissolved, they are to be mixed and stirred, which causes a black precipitate to form. After this mixture has stood for a few hours it is to be thrown on a filter, and the precipitate to be well washed with water to free it from sulphate of potassa, and then dried. When dry it is to be boiled in coal-tar naptha to extract a brown

substance from it, and this process must be repeated several times until such substance is entirely separated. The residue is then to be boiled in methylated spirit to extract the coloring matter, and the spirit is afterwards to be separated from the coloring matter by distillation. The coloring matter thus obtained is a solid of a bronze color. The coloring matter, when required for use, is to be powdered with a given quantity of oxalic or tartaric acid, and moistened with a little methylated spirit, and is then thrown into boiling water. The materials to be dyed are then to be immersed, the solution being kept boiling, and when dyed they are to be washed with cold water, to cleanse them from the acid. The materials thus dyed are of a lilac or purple color of a very durable character, the tints or shades of which may be varied by the quantity of coloring matter used.

FIG. 1— Perkin's First Patent



Preparation of Colour.

6 ounces of aniline were taken = 180 grms.
and converted into the neutral sulphate of aniline
and then mixed with a solution of Bichromate of
potassium

186 grammes of aniline requires 98 grm of Sulphuric
acid and 297.2 of Bichromate of Potassium
The product ought to weigh 180 gr.

Experiments upon
the New Colouring matter
June 26th 1856.

Eq. $C_{12}H_7N.H_2S_2O_8 + 2(KCr_2O_7)$
100. of Aniline require 117. of HSO_4

Bottle and Aniline = 28.8
Bottle = 17.0
11.8

Red requires 16.2 HSO_4 16.2
17.0
Bottle & HSO_4 = 31.2

KCr_2O_7 = 43.4

In this experiment the $C_{12}H_7N.2HSO_4$ was
added to a warm solution of the KCr_2O_7 the black
substance was deposited immediately with
evolution of heat.
The product was a dirty red substance.

FIG. 3—Another Page from the Notebook

FIG. 2—Page from an Early Notebook of Perkin's now in the possession of the City of London School (reproduced by kind permission of the School Authorities). Mauve was discovered at Easter 1856, and this page is dated 26th June 1856

those from an authentic sample of Perkin's dye which we were fortunate enough to possess.

We had shot our bolt. Yet the first smart of defeat was soon alleviated. We found that a colleague also had prepared a sample of Mauve, and when we learned that he had reasoned and experimented precisely as we had done and with precisely the same result, our self-respect was in some measure restored.

We also heard that others, unfortunately not personally known to us, had made the attempt, and they kindly furnished us with experimental details. It is less important that we were at variance in several respects than that we were in agreement in this: that the experience was chastening and that we should probably never understand how Perkin succeeded in converting an unsatisfactory experiment into a commercial proposition.

When time permitted, some weeks later, we turned again to the nineteenth-century literature and chanced upon descriptions of several processes for the manufacture of Mauve[4–7]. They were not very illuminating, and we felt little need of the reminder by one author that the process is laborious and tedious. All the processes utilised the half-sulphate of aniline, but there was no general agreement on the amount of potassium dichromate: this varied from 0·25 to 0·5 mol. to each molecule of amine (we had preferred the former amount), but two present-day experimenters had selected as little as 0·125 mol. and even 0·035 mol.

This is hardly the place for a complete record of our own experience in making Mauve, but it may be of interest to recall Perkin's statement that he eventually simplified his process. We attempted to do the same. We omitted, as did Perkin, extraction of the crude oxidation product with benzene and tried boiling out the Mauve with water or with dilute ethanol. In some measure we were successful, but the method was laborious, and we thankfully returned to our Soxhlet apparatus.

When such experimental work as we did was nearing completion a totally unexpected event took place, one which is part of quite another story. By assiduous attention to rumour and hearsay, a little correspondence, and a hopeful journey we were permitted to examine a very early notebook of Perkin's now in the keeping of the City of London School. The Headmaster, Dr. A. W. Barton, and the Senior Science Master, Mr. R. H. Dyball, very generously placed this book at our disposal for the time being to facilitate closer examination. The existence of a notebook descriptive of Perkin's early experiments on his new colouring matter had not previously been suspected, and it is obvious that this is a treasure of the greatest historic interest. Only the middle portion, which is fittingly soiled by Perkin's mauve-coloured finger-prints, is devoted to Mauve. The first entry bears the heading "Experiments upon the new colouring matter, June 26/1856" (Fig. 2). The last entry which bears a date was made on 24th November 1856, but it is almost certain that this was not the only notebook in use during this period. A description of the contents of this book is out of place here: all that is relevant is how Perkin prepared his colouring matter. It was soon evident that the period covered by the notes was one during which Perkin was feeling his way in a piece of empirical research work. There is no clue to the process which must eventually have been the basis of large-scale operations, but there are some details of two preparations of Mauve which make possible a few revealing calculations, bearing in mind the early errors in some atomic weights.

Perkin was human enough in his first experiment to fall into error in his calculation of the sulphuric acid required. This had the effect of introducing a second error, because the amount of potassium dichromate used was obviously based on the weight of the acid and not on that of the aniline. This, however, was no hindrance to a clear interpretation of the experiment as Perkin intended it. It occasioned no little surprise to find that he used the acid sulphate of aniline and that he employed a full molecular proportion of potassium dichromate, greatly in excess of the amount used by any subsequent known operator. In Perkin's second preparation we find that he tried "the neutral sulphate of aniline" (Fig. 3) and clearly and accurately recorded the weights of the reactants. It is immediately evident that in this preparation Perkin tried not only the effect of using aniline half-sulphate but also that of halving the previous proportion of potassium dichromate. Unfortunately, the outcome of neither experiment was recorded.

There we must end, for this historic notebook can tell us no more of how a youth, possessed of little more than courage and unquenchable enthusiasm, shaped the beginnings of the dyestuffs industry in those adventurous days of 1856.

RESEARCH LABORATORIES
IMPERIAL CHEMICAL INDUSTRIES LTD.
DYESTUFFS DIVISION
HEXAGON HOUSE
MANCHESTER 9

(*Received 12th September 1956*)

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[1] Perkin, W. H., *BP* 1984 (26th August 1856).
[2] Morris, L. E., *Dyer*, **115**, 770 (11th May 1956).
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[4] Gautier, *Traité des Matières Colorantes* (Paris 1874), p. 217.
[5] Oppler, in Ludwig Krieg's *Theorie und praktische Anwendung von Anilin in der Färberei und Druckerei* (Berlin 1886), Part 2, p. 115.
[6] Lefèvre, *Traité des Matières Colorantes* (Paris 1896), p. 759.
[7] Schultz, *Die Chemie des Steinkohlenteers* (1882), p. 531.

Appendix

PREPARATION OF MAUVE

As mentioned above, the product obtained by using 1 mol. of aniline, 0·5 mol. of *o*-toluidine, and 0·5 mol. of *p*-toluidine gives dyeings which are bluer and duller than those obtained from authentic samples of Mauve. A product giving the desired shade is obtained by using the following recipe, kindly supplied by Messrs. H. C. Olpin and J.

Wood of British Celanese Ltd., although the yield is still very low (1–2%).

Aniline (46·5 g., 0·5 mol.), *o*-toluidine (53·5 g., 0·5 mol.), and *p*-toluidine (107 g., 1 mol.) are dissolved in water (4 litres) and 2N-sulphuric acid (1 litre), the latter being just sufficient to form the sulphates of the bases. The solution is stirred at 20–25°C., and potassium dichromate (20·5 g.) in water (280 ml.) is added dropwise over a period of 3 hr.; stirring is continued for a further 1–2 hr., and the suspension allowed to stand overnight. The black precipitate is then filtered off, washed well with water to remove inorganic salts, and dried at 100°C. (yield 80–90 g.).

The product is then repeatedly extracted with benzene or solvent naphtha to remove a brown resinous material. After drying again, the colouring matter is obtained from the residue by repeated extraction with 25% aqueous alcohol. The alcoholic solution is evaporated to dryness, the colouring matter redissolved in undiluted alcohol, and the solution filtered from small quantities of a white residue. The solvent is then evaporated to yield the Mauve (yield approx. 4 g.).

Celebration of the Centenary of the Discovery of Mauve by W. H. Perkin

C. J. W. HOOPER

The various methods adopted to commemorate in 1956 the centenary of the discovery by William Henry Perkin of Mauve, the first coal-tar dye to be manufactured and applied on a large scale, are outlined, and a bibliography is given of the most important articles which have appeared.

ORGANISATION IN GREAT BRITAIN

The year 1956 has been the occasion of several important centenary celebrations, notably of the births of Wolfgang Amadeus Mozart, the composer (bicentenary), George Bernard Shaw, the playwright, and Sigmund Freud, who brought a new concept to the study of psychology. But in 1856 there occurred also two technical advances of profound significance—the discovery by Henry Bessemer of a cheap method of manufacturing steel and the preparation of the synthetic dye Mauve by W. H. Perkin. The latter, which may be regarded as marking the birth of the modern large organic chemical industry, has been more than adequately commemorated in 1956 by such activities as lectures, social gatherings, reviews of progress, and reminiscing. The most important functions have been held in London during May and in New York during September, but tribute has been paid to Perkin in many other centres.

As early as 1950 it was suggested to the Council of the Society of Dyers and Colourists that it was not too early to begin to plan the organisation of suitable celebrations of the centenary of Mauve in 1956, and Council set up a small committee [1]. When F. L. Goodall became President of the Society in 1953 he saw the necessity of "getting on with the job". The Perkin Centenary Committee was enlarged, and, under the chairmanship of Dr. C. J. T. Cronshaw, worked out preliminary plans for celebrations to be held in London during the Spring of 1956. It was felt that other societies, especially the various chemical bodies, were vitally concerned with Perkin's work, and invitations were sent to the Royal Society, the Chemical Society, the Society of Chemical Industry, and the Royal Institute of Chemistry to be represented on the committee. These bodies responded generously by nominating distinguished representatives, and a full meeting of the committee was held in May 1954.

Following the initiative of our own Society, it was decided that the Celebration would be sponsored jointly by the five bodies and the Association of British Chemical Manufacturers. H.R.H. The Duke of Edinburgh graciously consented to be Patron, and the President of the Royal Society (Sir Cyril Hinshelwood, D.Sc., F.R.S., Dr. Lee's Professor of Chemistry, Oxford University) was to be president. The Chairman of the Organising Committee was Sir Robert Robinson, O.M., F.R.S. (Emeritus Waynflete Professor of Chemistry, Oxford University). The detailed work was under the control of the Executive, Finance, Technical and Scientific, Social, and Publicity Committees, under the chairmanship of, respectively, Dr. C. J. T. Cronshaw, Mr. H. Jackson, Professor W. Bradley, Sir Ernest Goodale, C.B.E., and Mr. R. J. Smith. The General Secretary of the Celebration was Mr. J. W. Nicholls, F.C.I.S., so that a considerable proportion of the work was done by our Society's office.

CENTENARY CELEBRATION IN LONDON

The basis of the Celebration in London may be regarded as the four "Perkin Lectures", given appropriately in the lecture theatre of the Royal Institution, Albemarle Street, for Perkin, as a boy, had listened there to lectures by Michael Faraday, who had discovered benzene in that building, and in 1906 Professor Raphael Meldola had opened the Jubilee Celebration in that theatre. All four lectures are being published in full in the memorial volume [2]. The first lecturer was Professor John Read, F.R.S., Professor of Chemistry in the University of St. Andrews, who on Tuesday afternoon, 8th May 1956, discussed *The Life and Work of Perkin*, the chair being taken by Sir Robert Robinson. The lecturer was wearing a tie dyed with Mauveine acetate, and showed a Mauve-dyed tie worn by Perkin in 1906. The following morning *The Development of the Dyestuffs Industry* was outlined by Mr. Clifford Paine, Development Director of Imperial Chemical Industries Ltd., with Dr. L. A. Jordan (Director

of the Paint Research Station) in the chair on behalf of the President of the Society of Chemical Industry. The vote of thanks to Mr. Paine was very appropriately proposed by Dr. Herbert Levinstein, the only person present who had attended the Jubilee Celebration in 1906. The subsequent death of Dr. Levinstein, in August 1956, has removed a direct link with the British dyemaking industry in the period between Perkin's retirement and the outbreak of the First World War in 1914. The third lecture, on *The Tinctorial Arts Today*, was given by Mr. J. G. Evans (Technical Director of The Bradford Dyers' Association Ltd.), and on this occasion Mr. Paine was in the chair in the capacity of President of our Society. Finally, on the Thursday morning, May 10th, Sir Alexander R. Todd, F.R.S. (Professor of Organic Chemistry in the University of Cambridge), spoke on *The Development of Organic Chemistry since Perkin's Discovery* under the chairmanship of the President of the Chemical Society (Professor E. L. Hirst, F.R.S.). The proceedings concluded with a tribute from Sir Robert Robinson to all those, especially our own Society, who had contributed to the success of the Celebration.

The Centenary Celebration actually began on the Monday evening, 7th May 1956, with a soirée in honour of overseas delegates (from fourteen countries) in the hall of the Worshipful Company of Tallow Chandlers in Dowgate Hill in the City of London, which was attended by the President of the Board of Trade, the Lord Mayor, the Lady Mayoress, and the Sheriffs and their ladies. The Tallow Chandlers' Company displayed robes, royal warrants, and company plate. The principal Continental and Commonwealth countries and the U.S.A. were represented at the Celebration. The Tuesday evening was devoted to a reception at the rebuilt Guildhall, music being supplied by musicians from the Band of the Scots Guards. The assembled company in the lofty, brightly lit hall provided a glittering and most impressive spectacle.

The culmination of the Centenary Celebration was the Banquet, held at the Dorchester Hotel, Park Lane, on Wednesday, 9th May 1956, at which some 400 persons sat down to dinner. The oil painting of Perkin presented to him at the Jubilee Celebration in 1906 (see frontispiece) was displayed draped with mauve and illuminated. The chief guest was the Marquess of Salisbury, K.G., P.C., Lord President of the Council, who proposed the toast "Tribute to Perkin". Lord Salisbury felt that insufficient credit had been given to Perkin's father, who had risked his life savings for what might have seemed to be the whim of a youth. Perkin had left a dual heritage— industries based on organic chemistry and remarkable academic schools of science and of technology. In reply Sir Cyril Hinshelwood suggested that Perkin's discovery thrilled us so much because of the aesthetic appeal of colour. The subsequent loss of the dye industry from this country was a consequence of a misconceived set of educational ideals which had lingered on from the Renaissance. Scientific research should be regarded as an adventure.

The toast of "The Guests" was proposed by Mr. Paine as Senior Vice-president of the Centenary Celebration. In addition to distinguished representatives of overseas scientific and technical organisations several members of the Perkin family— including Mrs. Isobel Cramer (Perkin's grand-daughter), Mr. P. C. Kirkpatrick, Mr. W. R. Kirkpatrick, Dr. A. J. Dix Perkin, and Brigadier T. Dix Perkin— were present. Bearers of names "which ring a chime in the minds of anyone interested in the history of the British dyestuffs industry" were Major L. B. Holliday, Dr. Herbert Levinstein, and Lieut.-Col. K. Greville Williams. In his reply on behalf of overseas guests Professor Burckhardt Helferich, President of the Gesellschaft Deutscher Chemiker, stressed the great danger nowadays of overlooking unexpected results. On behalf of guests from the United Kingdom Mr. Arthur H. Brewin, Prime Warden of the Worshipful Company of Dyers, emphasised Perkin's associations with the City of London, including his education at the City of London School and his term as Master of the Leathersellers' Company. In 1907 Perkin had visited Dyers' Hall as President of the Society of Dyers and Colourists, and as a result the Dyers' Company offer annually a gold medal for research published in the Society's *Journal*.

Greetings telegrams were received from China, India, Italy, Japan, Norway, Pakistan, Sweden, and the U.S.S.R.

EXHIBITION AT THE SCIENCE MUSEUM

A rather more permanent feature of the Celebration in London was the Perkin Centenary Exhibition in Gallery 46 at the Science Museum, South Kensington, which was opened on Tuesday morning, 8th May 1956, by Dr. R. P. Linstead, C.B.E., F.R.S., Rector of the Imperial College of Science and Technology, which incorporates the Royal College of Science, the lineal descendant of the Royal College of Chemistry at which Perkin had studied under Hofmann; appropriately, it had been Dr. Linstead and his collaborators who had elucidated the structure of the phthalocyanines, containing the only new chromophore to be discovered for many years. Dr. Linstead stressed Perkin's youth and lack of formal qualifications, and drew the moral that we should not so plan and organise industry that no room was left for a young, free, and eager spirit. The speaker also emphasised the speed with which Perkin had acted— some twenty months after the initial discovery commercially manufactured Mauve was in use in at least one dyehouse. The real monument to Perkin is provided by the modern factories in which synthetic organic chemicals are made. A vote of thanks to Dr. Linstead and to Sir Robert Robinson for presiding was proposed by the Earl of Halsbury, Chairman of the Advisory Council of the Science Museum.

The exhibition itself was arranged in chronological order, starting with examples of natural dyes and their application and including an illustration of the woad mill near Wisbech still in operation at the beginning of this century. These were followed by several letters and notes in

Perkin's handwriting, and specimens of his dyes and dyeings. Then the great nineteenth-century landmarks in dyemaking were shown, and the complexity of modern dye manufacture was indicated by exhibits showing, for example, the stages from coal to the vat dye Caledon Jade Green XBN in sixteen weeks. Both the Society's work on fastness testing and the work of the British Colour Council were illustrated, and the exhibition included an attractive display of dyed and printed fabrics.

Although it was originally intended to close the exhibition at the end of May, it proved so popular that it was continued until 18th July 1956.

PERKIN CENTENARY FUND

As a still more permanent, living memorial to the centenary, and hence to Perkin's discovery itself, an appeal for support for the Perkin Centenary Fund was issued, and over £30,000 has already been subscribed. A Trust Deed has been drawn up to govern the administration of the Fund, and the six sponsoring bodies have nominated the following Trustees—

Royal Society
Sir Robert Robinson, O.M., D.Sc., F.R.S.
Chemical Society
Michael Willcox Perrin, C.B.E., M.A., F.R.I.C.
Society of Chemical Industry
Leslie Herbert Lampitt, D.Sc., F.R.I.C., M.I.Chem.E.
Society of Dyers and Colourists
Walter Rugby Mathers
Royal Institute of Chemistry
Douglas William Hill, Ph.D., D.Sc., F.R.I.C.
Association of British Chemical Manufacturers
Harry Jackson

The Secretary of the Trustees is Mr. J. R. Ruck Keene, M.B.E., T.D., M.A., General Secretary of the Chemical Society.

The main object of the Fund is the promotion, advancement, and encouragement of technical education in relation to all aspects of the manufacture and the application of colouring matters. In conformity with this the Fund, both capital and income, is to be applied to the provision of Perkin Centenary Scholarships, which may be applied— (*a*) to enable men and women in industry to study the technology of the production and/or the application of colouring matters; and (*b*) to assist teachers of these technologies to study their subjects more widely. Thus the Fund could be used *inter alia*— (i) to provide refresher courses to study the latest developments; (ii) to provide travelling scholarships; and (iii) to finance studies, at home or overseas, at universities, at technical colleges, and in industry.

It is envisaged that payments will be made through universities, university colleges, technical colleges, or similar institutions.

CENTENNIAL CELEBRATIONS IN NEW YORK

The early stages of the idea of holding "centennial" celebrations in America were similar to those in Great Britain. At the November 1952 meeting of the National Convention Committee of the American Association of Textile Chemists and Colorists (AATCC) it was suggested that in 1956 no Annual Convention as such should be held, but instead a "Centennial Program" in which other bodies would be invited to participate. In 1906 the AATCC was not in existence, but on 6th October 1906 the American Chemical Society and the American Section of the Society of Chemical Industry gave a dinner to Perkin in New York. Before sponsoring centennial celebrations, the AATCC thought that these two bodies should be approached, but both replied that the AATCC was the appropriate organisation to undertake the task.

The proposal to hold the Centennial at the Waldorf–Astoria Hotel in New York was approved at the April 1953 meeting of the AATCC Council, and a Perkin Centennial Executive Committee was appointed with Mr. Raymond W. Jacoby as chairman. At a very early stage our own Society was invited to sponsor the main address, on *Sir William Perkin— His Life and Work*, and Sir Robert Robinson very kindly agreed to travel to New York on behalf of the Society. Also, our President was *ex officio* a member of the Perkin Centennial General Committee.

Finally, twenty-seven societies and two United States Government departments co-operated with the AATCC in the organisation of the Centennial and were represented on the General Committee [3]. Nine committees were set up to deal with dining and banquet, education, entertainment, exhibits, general programme, ladies, printing, publicity, and registration and reservations. A tenth committee was concerned with the AATCC Convention technical programme, and Dr. H. J. White Jr. (Textile Research Institute) was appointed Editor of *The Proceedings of the Perkin Centennial* [4], which is expected to contain some sixty papers.

International Day

Monday, 10th September 1956, was "International Day". The morning session was devoted to "Colorfastness of Textiles" and was sponsored by the AATCC and the American Society for Testing Materials. After a welcome from Mr. Raymond W. Jacoby (as Chairman of the Executive Committee and President of the AATCC) a paper on *A Century of Progress in Colorfastness Test Methods* was given by Dr. M. L. Staples of the Ontario Research Foundation, Toronto, Canada, and *Current Developments in Colorfastness Testing* were described by Monsieur J. P. Niederhauser for France, Dr. P. Rabe for Germany, Dr. F. Buxtorf for Switzerland, Dr. P. W. Cunliffe (Chairman of our Society's Fastness Tests Co-ordinating Committee) for the United Kingdom, and Mr. C. A. Sylvester (Chairman of the AATCC Technical Committee on Research) for the U.S.A.

Our own Society played a very prominent part at the luncheon session, held on the Starlight Roof under the chairmanship of Mr. H. Thomas Hallowell Jr. (American Standards Association), at which a telegram of greeting from President Eisenhower was read. Firstly, the opportunity was taken by our President (Mr. Clifford Paine) to present to Mrs. W. H. Carothers the Perkin Medal awarded posthumously to Dr. Wallace H.

Carothers for the discovery of nylon. Subsequently Mr. C. H. Greenewalt, President of E.I. du Pont de Nemours & Co. Inc., introduced Sir Robert Robinson, who gave his address, on *Sir William Perkin— His Life and Work*, on behalf of our Society. There followed a seven-minute film, *Rhapsody in Color*, based on Liszt's Second Hungarian Rhapsody, in which abstract colour forms were synchronised with the music.

The afternoon session was devoted to *Color— the Catalyst of Commerce*. Under the chairmanship of C. W. Dorn (AATCC) a panel of experts (including our President) discussed and answered questions on the impact of man-made colour on several fields of activity, including advertising, motor-cars, packaging, safety, style and fashion, and television.

Technical Sessions

The rest of the programme was largely devoted to papers (abstracts of which [3] were available) covering various aspects of colour and its application. In several cases two sessions were held simultaneously, so that visitors had to make a choice. The subjects and sponsors of the various sessions ranged widely, from *The Application of Colorants to Drugs, Cosmetics, and Medicine* (American Pharmaceutical Association, Society of Cosmetic Chemists, and U.S. Department of Pathology) on the Tuesday morning, 11th September 1956, to *Theories of Dyeing* (Textile Research Institute) on Saturday morning, 15th September 1956 [3].

The Saturday afternoon was devoted to the annual AATCC Intersectional Prize Paper Contest, in which eight sections, ranging from Rhode Island to the Pacific Southwest, competed.

Social Events

Apart from the purely technical sessions, the centennial celebrations included a number of activities of a more social character. A varied ladies' programme included a cruise around Manhattan Island and a visit to the United Nations Building. A full programme of cinematograph films was shown each day.

The Olney Medal Award Luncheon of the AATCC was held on the Thursday, when the medal was presented to Dr. W. J. Hamburger, Director of the Fabric Research Laboratories. That afternoon was devoted to *Cavalcade of Color*, described as "a stage revue with music and fashion show dramatizing a century's evolution of colour as a compelling force in the creation, promotion and popular enjoyment of fashion".

Another medal award was made on the Friday evening, when the fiftieth Perkin Medal of the Society of Chemical Industry was presented to Dr. E. C. Britton of the Dow Chemical Co., who has contributed to the production of synthetic dyes, pharmaceuticals, synthetic rubber, silicone resins, and other chemical compounds. The medal, described as the highest honour in American industrial chemistry, was founded in 1906 and first presented to Sir William Perkin to commemorate the jubilee of his discovery. The dinner, guests at which had been provided with mauve-dyed ties, was sponsored by the American Section of the S.C.I. in conjunction with the American Chemical Society, the American Institute of Chemical Engineers, the Electrochemical Society, and the American Section of the Société de Chimie Industrielle.

At the Annual AATCC Banquet, held on the Saturday evening, Mr. Clifford Paine, on behalf of Imperial Chemical Industries Ltd., presented a painting of Sir William H. Perkin to the AATCC. Other presentations were of the *American Dyestuff Reporter* Award to Mr. Fred Fortess and of the Intersectional Papers Contest Award to the Piedmont Section, and the President of the AATCC presented a scroll to Dr. Harold C. Chapin, Secretary of the AATCC from November 1933 until August 1956. The address was given by General Anthony C. McAuliffe, recently retired from the U.S. Army.

Exhibitions

An exhibition was arranged in the Waldorf–Astoria Hotel for the week of the celebrations. The Astor Gallery was devoted to *A More Colorful World*, sponsored by the manufacturers of organic colouring matters to show the history of man's attempts to colour various materials; other exhibits, including dioramas, depicted industries and many products, such as pharmaceuticals, agricultural chemicals, plastics, synthetic rubber, and photographic chemicals, that have grown out of dye research. Two other rooms were devoted to functional finishes and to fibres and fabrics respectively. A special exhibit was concerned with colour fastness and testing equipment and methods developed by the AATCC.

At the Grand Central Terminal in New York City the Eastman Kodak Co. staged an exhibit to depict the application of modern colour photography. A continuous colour slide show demonstrated the preparation and the development of colour film. Apart from two pairs of colour transparencies each 30 in. × 40 in. in size, the Kodak Colorama (18 ft. × 60 ft.) showed the Water Wheel Falls in Yosemite National Park, California.

ACTIVITIES OF THE SOCIETY'S SECTIONS

All the local Sections of the Society have celebrated the Perkin Centenary in one way or another. Perhaps pride of place should go to the London Section, for it organised a very successful and enjoyable Perkin Centenary Dinner and Ball at the Waldorf Hotel, Aldwych, on Thursday, 10th May 1956, immediately following the end of the official Celebration in London. The guests included the President of the Royal Institute of Chemistry and the Chairman of the Association of British Chemical Manufacturers, as well as our own President. The London Section has also organised an essay competition [5], for persons under 26 years old, on *The Influence of Perkin's Discovery, and of the Synthetic Dyes which followed it, on any trade of the candidate's choice*, the closing date being 31st December 1956.

Probably the first, in chronological order, to celebrate the centenary was the Manchester Section, which on Saturday, 18th February 1956, held a Perkin Centenary Ball at the Midland Hotel,

Manchester. The toast to the memory of Sir W. H. Perkin, F.R.S., was proposed by the Chairman (Mr. John Boulton), who stressed Perkin's youth when he made his discovery. Members of one firm (CDC) sported nylon handkerchiefs dyed with Mauve. The Section also organised an exhibition, entitled *A Hundred Years of Colour*, which was held in the Central Library during February 13–25th. Among interesting exhibits were dyeings of Mauve on cotton, silk, viscose rayon, and nylon, a print on cloth of the former dyehouse of the Manchester College of Technology, and the only extant copy of *The Chemistry of Calico Printing, 1790–1835, and History of Print Works in the Manchester District 1700–1846* by John Graham. The annual one-day symposium of the Section, held in the College of Science and Technology, was entitled *The Second Hundred Years*. In his introductory paper on *Recent Developments in Dyeing* Mr. J. Boulton quoted statistics to show the magnitude and the importance of the dyeing and finishing industry, and Mr. J. R. Whinfield, C.B.E. (co-discoverer of Terylene), discussed *The Struggle for Supremacy among Textile Fibres*. In the afternoon *Developments in Textile Printing* were discussed by Mr. F. V. Davis, and *Developments in Textile Finishing* by Dr. G. Landells.

The Huddersfield Section co-operated in the organisation of an exhibition held at Huddersfield Technical College during Thursday–Monday, March 9–12th. Mr. Horace Turner (Honorary Secretary of the Huddersfield Section) broadcast on the exhibition from Leeds in the B.B.C.'s programme *The Week Ahead*.

The next two Sections to celebrate the Perkin Centenary were the Northern Ireland and the Scottish, both of which held Dinner–Dances on Saturday, September 28th, the former at Woodbourne House Hotel, Suffolk, Dunmurry, and the latter at the Ca'doro Restaurant, Glasgow. The Scottish Section followed with a lecture by Professor John Read, F.R.S., on *The Life and Work of Perkin* at the St. Enoch Hotel, Glasgow, on Tuesday, October 16th. The Northern Ireland Section heard a lecture with the same title given by Mr. J. Boulton on Wednesday, November 14th, at Thompson's Restaurant, Donegall Place, Belfast. Mr. Boulton was concerned to analyse the reasons for Perkin's greatness: the discovery itself was an accident, an incident; its successful exploitation was due to Perkin's attributes as a whole man, a classical example of the fallacy of the now widely held view that scientists and technologists are lacking in general culture. After the lecture Mr. R. V. Kirkpatrick was presented with the Northern Ireland Perkin Centenary prize, awarded for an essay on *The Influence of Perkin on the Textile Trade*. The Midlands Section held a Perkin Centenary Celebration Dinner–Dance at the Welbeck Hotel, Nottingham, on Saturday, October 20th, at which mauve lace handkerchiefs were given to the ladies. In proposing the toast to the ladies, Mr. W. L. Langton quoted from the Book of Proverbs (Chapter XXXI, verse 22)—

> She maketh herself coverings of tapestry; her clothing is silk and purple.

The West Riding Section organised two Perkin Centenary Lectures— Professor J. Read's lecture at the Hotel Metropole, Leeds, on Wednesday, October 31st, and Dr. C. M. Whittaker's lecture dealing with the *Renaissance of the British Dye Industry*[6] at the Victoria Hotel, Bradford, the following evening— and a Dinner–Dance at the Victoria Hotel on the Friday. In addition, an exhibition was arranged at the Bradford Technical College; it was opened by Mr. Fred Smith (Immediate Past President of the Society) on Thursday, November 1st, and continued until the Saturday.

OTHER CELEBRATIONS IN GREAT BRITAIN

A notable feature of the less official celebrations of the centenary in Great Britain was the interest taken by local historians in the district in which Perkin's works had been situated. This culminated in the unveiling, on Saturday morning, September 8th, in the grounds of Sudbury Methodist Church, close to the Harrow Road, of a bronze plaque bearing the inscription—

> THIS PLAQUE WAS PLACED BY THE
> BOROUGH OF WEMBLEY HISTORY SOCIETY
> TO MARK THE CENTENARY OF THE
> DISCOVERY OF THE FIRST ANILINE DYE
> MAUVE BY SIR WILLIAM PERKIN
> FOUNDER OF THE ORIGINAL PLACE OF
> WORSHIP ON THIS SITE
> 1856–1956

Perkin had built a small mission hall in 1876, for his family, his staff, and the few local residents, which he ran on undenominational lines. It was taken over by the Wesleyan Methodists just before the First World War.

The Rev. H. W. R. Elsley, Chairman of the Wembley History Society, presided at the ceremony, and paid tribute to the tenacity of purpose of Dr. Harold Egan, who had organised the appeal for funds to provide the plaque. Mr. J. W. Nicholls (General Secretary of the Perkin Centenary Celebration) brought greetings from Sir Robert Robinson (Chairman of the Centenary), who was prevented from attending by his visit to New York for the Perkin Centennial. Dr. H. W. Ellis (Chairman of the London Section of our Society) congratulated the History Society on behalf of our Council and expressed the regrets of our President (Mr. Clifford Paine) and our Immediate Past President (Mr. Fred Smith) at not being able to attend. The Rev. C. J. B. Milton (curate of St. Andrews, Sudbury) read the passage from Ecclesiasticus (Chapter XLIV) beginning *Let us now praise famous men*.

Professor E. D. Hughes, F.R.S., Professor of Chemistry in University College, London, said that Perkin's life should be an inspiration to all men. He removed the Mauve-dyed veiling, and was given one piece as a souvenir, the other piece being handed to the archivist of the History Society. The Rev. H. Colbeck (Minister of Sudbury Methodist Church) dedicated the plaque and offered prayer. Councillor L. J. Sullivan, J.P. (Mayor of Wembley and President of the History Society), spoke of Perkin's deep religious sense and love of home: the district was proud that Perkin had

once lived in what was now the Borough of Wembley.

Those present at the ceremony included Mrs. I. Cramer (grand-daughter) and Mr. R. C. Kirkpatrick (son-in-law of Sir William Perkin), representatives of the sponsoring organisations of the Perkin Centenary, Sudbury Methodists, and members of the History Society. Our Society was represented also by Mr. C. A. Mills (Chairman of the Midlands Section) and Dr. C. J. W. Hooper (Editor and Technical Officer).

The Wembley History Society had arranged a small Perkin exhibition at the Barham Park Public Library.

The interest of local historians was stimulated also by a lecture on *The Life and Work of William Henry Perkin* given by Mr. L. E. Morris (Editor of *The Dyer*) before the annual meeting of the Middlesex Local History Council [7]. Mr. Morris said that Perkin had been practically ignored in his own county: he was not mentioned in *The Victoria County History*, and he was omitted from the chapter on "Famous County Personalities" in the County Council's book on Middlesex. The coal-tar industry had a longer and more continuous existence in Middlesex than anywhere else in the world: in 1868 C. H. Greville Williams, a former collaborator of Perkin's, founded the firm of Williams, Thomas & Dower Ltd., which made coal-tar dyes at Brentford until 1877; his two elder sons established a dye factory at Hounslow, which still flourishes under the name of Williams (Hounslow) Ltd., and in fact members of the Greville Williams family attended the Perkin Centenary Banquet.

Mr. R. Brightman spoke to the Manchester Section of the Society of Chemical Industry on *Manchester and the Origins of the Dyestuffs Industry* at Manchester University on 6th April 1956 [8]. This district had been at an early date the centre of the of the manufacture of murexide and its use in printing and of the manufacture of picric acid for dyeing wool and silk.

The Department of Colour Chemistry and Dyeing of the University of Leeds staged its Perkin Centenary Exhibition during Wednesday–Friday, September 26–28th. Apart from historic letters and the exhibits of dyemaking firms, the experimental preparation of Mauve was demonstrated. A noteworthy feature was the first exhibit showing the immense work on the preparation of the Second Edition of the *Colour Index*. The tribute to Perkin was appropriate, for Perkin's second son, Arthur George, was Head of the Department from 1916 till 1926.

Finally, it may be mentioned that the British Colour Council early in the year issued a special card—*Homage to Perkin* (B.C.C. 225)—showing seven fashion shades based on Perkin's mauve, viz. wild orchis, daphne pink, pink clover, sweet lavender, purple lilac, homage purple, and violet (see also p. 581). Various dyemaking firms commemorated the centenary with special advertisements and displays, and assisted greatly with the various exhibitions held throughout the country.

OTHER CELEBRATIONS OVERSEAS

Next in interest after the Perkin Centennial in New York come the celebrations organised by our affiliate, The Society of Dyers and Colourists of Australia. Tape recordings of the lectures given by Professor John Read and Mr. J. G. Evans at the Royal Institution (cf. p. 566) were sent by airmail to Melbourne and were heard at a joint meeting of the New South Wales Section with the Royal Australian Chemical Institute and the University of Technology Chemical Society held during May.

The Council of the Australian Society for the first time organised an exhibit of its own at the Chemex Exhibition held in Melbourne during April. The South Australian Section celebrated the centenary on May 8th by holding a meeting at the University of Adelaide jointly with the R.A.C.I. and the South Australian Section of the Oil and Colour Chemists' Association: Mr. J. Brear lectured on *Chemical Discoveries and the Textile Industry*. The New South Wales Section held its Annual Dinner against a background of exhibits commemorating the Perkin Centenary. A series of postgraduate lectures on textile chemistry and dyeing was organised by the Royal Melbourne Technical College.

No special celebrations were arranged in Canada, but the Canadian Association of Textile Colourists and Chemists co-operated with the AATCC in organising the Perkin Centennial in New York, at which the CATCC representative was Dr. L. J. Sheps.

In the U.S.A. Lowell Technological Institute (Lowell, Mass.) held a celebration during September 26–28th which included a lecture and a display of rare books. At a special convocation honorary degrees were conferred upon men famous all over the world in the fields of science, industry, and public service. One of the newest buildings on the campus was dedicated and the programme culminated in a public Open House on Friday, September 28th, the first since 1937. Sir William himself visited the campus, then the Lowell Textile School, in 1906.

The American Cyanamid Co. made a special film, *Portrait of an Industry*, to commemorate the discovery.

Lectures commemorating the centenary were held in several Continental countries. The Schweizerischer Verein der Chemiker-Coloristen held its summer meeting on Saturday, June 2nd, in the form of a cruise on Lake Constance from Romanshorn toward Überlingen. In the presence of guests from France and Germany and students from the Federal Polytechnic in Zürich, Professor R. Wizinger, of the Department of Colour Chemistry of Basle University, discussed *The Direct and Indirect Significance of the Development of the First Aniline Dye 100 years ago*. Dyeings of Mauve on silk and lilac Victorian 1d. postage stamps were shown, and interesting relationships traced with the development of the silk-ribbon industry in Basle by the Huguenots. The other papers and a display of textiles were confined to the newer man-made fibres. A picture of Perkin

(presented to the S.V.C.C. by ICI) hung over the stairway of the boat.

The Schweizerische Vereinigung von Färbereifachleuten devoted its autumn meeting, held on September 8th in Basle, to the centenary. Dr. N. Jaquet discussed *The Conditions for the Establishment and the Development of the Coal-tar Dye Industry in Switzerland*, Dr. W. Jenny outlined *The Evolution of Dye Chemistry during the last 100 years*, and Dr. K. Menzi described *The Craft of Dyeing before Perkin*. An exhibition illustrated the last-named theme, the lost art of dyeing with natural dyes, with valuable material, dating from the fourth century, from various Swiss collections. These lectures have been published in the October 1956 issue of *SVF Fachorgan für Textilveredlung* [9], that on natural dyes being a particularly full and well illustrated account; the same journal contains also reminiscences of practical dyeing during the 1890s, and histories of the Zürich dyeing industry and the Basle dyemaking firms.

In Sweden the centenary was commemorated at the annual dinner of Svenska Färgeritekniska Riksförbundet (see p. 580).

In Germany one of the papers given at the annual conference of the Verein der Textil-Chemiker und -Coloristen, held in Baden-Baden during May 3rd–5th, was a survey by Dr. Karl Saftien of *100 years of the Coal-tar Dye Industry*, which quoted several production statistics [10]. Thus in 1954 Western Germany and Switzerland each accounted for about 30% by value of world exports of coal-tar dyes, with the United Kingdom and the U.S.A. exporting only about 12% each.

SPECIAL PUBLICATIONS AND ARTICLES

Many of the lectures mentioned in the preceding pages were subsequently published in one form or another. In addition, several scientific and trade journals took the opportunity of publishing special articles or special issues. Although many of these merely covered familiar ground, several were the result of painstaking historical research. The story is still far from complete: as the editorial in the excellent issue of the *Dyer* for 11th May 1956 points out [11], we know very little about the economic aspects—costs, quantities, customers, prices— of the firm of Perkin & Sons*.

An outstanding paper, which brings to light many hitherto unknown aspects of Perkin's work, is *The Genius of Perkin* by L. E. Morris [12]; an interesting point is the speed with which the French expression *couleur mauve* (mallow colour) became naturalised as "mauve". The same author [13] stresses the contribution made by Perkin's brother, Thomas Dix Perkin, as businessman and administrator, to the success of the enterprise. He also [14] outlines the present topography of the site of the Greenford Green works. In the same issue A. Johnson and H. A. Turner [15] sketch the progress of *Synthetic Dyes from the Time of Perkin*.

Mention may be made here of the account by W. H. Cliffe [16], which precedes the present paper, of modern attempts to prepare Mauve.

* It may be possible to throw more light on these aspects in the near future (cf. footnote on p. 563).

On 7th May 1956 the *Manchester Guardian* published an interesting supplement in celebration of the centenary, and subsequently issued it as a separate pamphlet [17]. The contents included *A Nephew's Personal Recollections of Perkin* by A. H. Waters, *The Start of a New Industry* by Professor W. Bradley, *The Perkin Family and the Textile Industry* by R. G. Fargher (dealing with the two sons W. H. and A. G., and mentioning the former's Non-flam finish for cotton), *Perkin's Influence on Medicine* by F. L. Rose (showing how research on dyes has led directly to the technique of biological staining and to important groups of drugs, including the sulphonamides), *Raw Materials derived from Coal* by L. W. Blundell, and *A More Fragrant World* by P. F. Spencer (Perkin's research leading to the synthesis of coumarin, and subsequently methylumbelliferone, a fluorescent brightening agent).

The Perkin Centennial issue of the *American Dyestuff Reporter* [3] contains several items of interest, apart from full details of the programme of the Perkin Centennial celebrations in New York. Letters of greeting to the AATCC from the participating societies, including our own, are reproduced. N. S. Knaggs describes the natural dyes in *Dyestuffs of the Ancients*, and an article on Perkin by S. M. Edelstein is accompanied by a practically complete bibliography to his patents, papers, and articles, speeches and awards, obituaries and references after his death, and references to the Perkin reaction. A very clear photograph is included of Perkin and his family at Brookline (Mass.) in 1906. This issue contains also a history of the AATCC since its founding 35 years ago, written by N. A. Johnson.

Another outstanding publication is the June issue of the *Ciba Review* [18]. The list of articles, which are illustrated by interesting pictures, including one of the benzene ring taken from the "Berichte der Durstigen Chemischen Gesellschaft", is as follows—

The Age	W. Voegelin
Perkin, the Man	W. Voegelin
Chemistry and Chemical Education in Perkin's Student Days	J. Schroeter
Perkin as Scientist	W. Bradley
Perkin, the Manufacturer	W. Bradley
The Legacy of Perkin	W. Bradley
Dyestuffs Research and Application	W. Jenny
Bibliography (34 references)	

In another valuable article, on *Perkin and the Dyestuffs Industry in Britain*, R. Brightman [19] discusses the state of chemical science and industry in Britain at the time of Perkin's discovery, and emphasises the difficulties which Perkin faced in obtaining or preparing suitable primary materials and intermediates. This author also points to the existence at that period of an infant dye industry in Manchester, and pays tribute to the work of the Manchester Literary and Philosophical Society in the mid-Victorian era in fostering the spread of ideas and the interaction of science and technology.

Interesting material on the economic history of Scotland, including statistics and costings, i

given by R. A. Peel in a series of articles on *Perkin and the Scottish Alizarin Dyers* [20]. Glasgow was the premier cotton-manufacturing centre of Britain during the period 1780–1850, before leadership passed to Lancashire, and Glasgow took to heavy industry.

In a paper on *The Perkin Family of Organic Chemists* Sir Robert Robinson [21] attempts to trace a "family tree" from Lavoisier up till the present time, stressing the interconnections between the different research schools and especially the far-reaching influence of W. H. Perkin, Junior. Sir J. Simonsen has written an article on the *Birth of the Synthetic Dye Industry* [22].

Another article worthy of mention is *Perkin's Green* [23], published by Glaxo Laboratories Ltd., whose premises at Greenford Green include land once owned by Perkin & Sons. A connection is suggested between Perkin's early enthusiasm for crystalline form and the recent crystallisation at Greenford of vitamin B_{12}.

Finally, an editorial in the *Journal of the Oil and Colour Chemists' Association* [24] quotes evidence that the Victorians were not such killjoys as is now supposed, and suggests, by reference to a typical menu of 1873, that Sir William might have found the Perkin Centenary Banquet slightly anaemic (possibly the writer is unaware that Sir William was a vegetarian and a teetotaller).

Among overseas periodicals, the *Canadian Textile Journal* made its August 24th issue a "tribute to Perkin". An interesting but brief article by Dr. F. W. Atack [25] gives a few reminiscences of the dyemaking industry in England during the First World War. In *Teintex* M. Ernest A. Sack (Vice-président de l'Union Syndicale des Fabricants de Matières Colorantes et d'Hydrosulfites) has written on *La "Mauvéine" est centenaire* [26]. Finally, the May issue of *Tekstil-naya promyshlennost'* [*Textile Industry*], published by the Ministry of Textile Industry of the U.S.S.R., has a page of text, including a portrait of Perkin, devoted to *Centenary of the Discovery of One of the First Synthetic Dyes* [27].

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[2] Perkin Centenary Memorial Volume (to be published in 1957).

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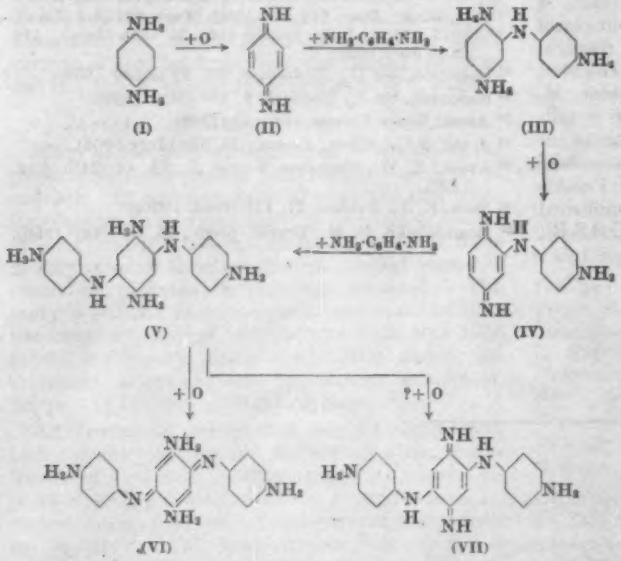
CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents

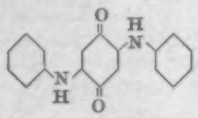
Fur Dyes and their Oxidation Products

Since in the paper by G. Sandberg[1] critical reference is made to a quotation from one of my works, and since some of the references are misquoted and a number of other pertinent references overlooked, which would have presented a more accurate picture of the course of oxidation of *p*-phenylenediamine as known today, and which would also have enabled Sandberg to interpret better the results of his own experiments, the following comments may help to clarify the position—

(1) The constitution of Bandrowski's base has *not* been definitely established, nor conclusively confirmed. By synthesising a compound with the structure originally proposed by Bandrowski (tetra-aminodiphenyl-*p*-azophenylene, or benzoquinone-1:4-bis-(2:5-diaminoanil)), Sunde and Lauer[2] have shown that Bandrowski's base is *not* identical therewith, because of a considerably lower melting point and because of other differences in essential characteristics. Green[3], rather than confirming Bandrowski's formula, had suggested another formula for the compound, and had indicated the manner of formation as proceeding by the stepwise addition of benzoquinonedi-imine to *p*-phenylenediamine, as follows—



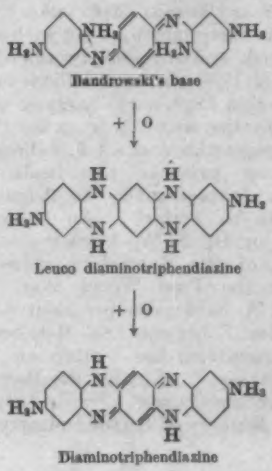
Step VII is a configuration for Bandrowski's base, not previously suggested, which I have added as a possibility, and represents an exact analogy to the quinonoid addition compounds of *p*-benzoquinone and amines, such as—



2:5-Dianilino-1:4-benzoquinone

Quinonoid derivatives of this general type are known to be more reactive to oxidation and reduction treatment at the quinone linkages than at the secondary amino linkages. Under the conditions present in the uncatalysed dye solution containing *p*-phenylenediamine and hydrogen peroxide, the Green stepwise formulation seems more logical than the spontaneous formation of a trimeric compound from benzoquinonedi-imine. It is at this stage of the oxidation process that investigation by polarographic methods should prove enlightening.

(2) Concerning the further oxidation products of Bandrowski's base, I suggested[3] in 1921 the possible formation of a triphendiazine derivative, simply on the basis of analogous ring-closure in other similarly constituted compounds. No evidence or proof was submitted. The formulation which I indicated—



was actually that of the leuco compound, and this also was in line with the first step in ring-closure of analogous compounds. Cox[5] accepted the idea of azine formation, but considered the compound formed to have a more complex structure than that suggested by me. Mr. Sandberg seems alternately to accept the azine idea and to doubt its formation. To the present time there has been no more than very tenuous evidence of the existence of an azine compound among the oxidation products of *p*-phenylenediamine.

There is, however, definite evidence of the existence of a further reaction product in the oxidation of Bandrowski's base[6], as shown by the following facts—

(*a*) Bandrowski's base is quite insoluble in water, but an aqueous suspension will dye wool or white hair a violet-blue grey at boiling temperature.

(*b*) A solution of Bandrowski's base in pyridine

—in which it is soluble to the extent of 10%—will dye wool or white hair a deep violet–black, almost as intense as a direct dyeing with *p*-phenylenediamine and hydrogen peroxide.

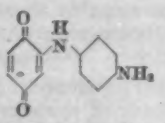
(*c*) Treatment of wool or white hair with a solution of reduced Bandrowski's base and exposure to air will result in a dark, violet–grey dyeing.

All these dyeings are fast to washing and soaping, and all are completely decolorised by treatment with sodium bisulphite or sodium hydrosulphite. Fresh dyeings of short duration (1–4 hr.) with *p*-phenylenediamine and hydrogen peroxide act in a similar manner. However, if treated with dilute hydrogen peroxide (48–96 hr.), or if simply left exposed to the air for a prolonged period (2–4 months), all these dyeings turn reddish or reddish brown, depending on the original depth of colour. This change is in line with experience in fur dyeing, where furs, dyed black with *p*-phenylenediamine and hydrogen peroxide only, invariably turn reddish or brownish in time. Dyeings which have changed colour as a result of further oxidation, either with peroxide or by prolonged exposure to air, can no longer be decolorised: in fact, they are quite resistant to the action of reducing agents.

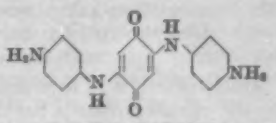
These facts tend to show that Bandrowski's base is the actual colouring matter in dyeing with *p*-phenylenediamine, and that further oxidation, instead of intensifying the dye, causes an undesirable change. An indication of the possible nature of this change may be seen in an observation which I made[6]: specimens of Bandrowski's base with an original melting point ranging from 236° to 239°C., and shown to be free from *p*-phenylenediamine, after storage for a year in a glass jar had a melting point ranging from 220° to 225°C., and showed the definite and unmistakable presence of *p*-phenylenediamine. Mr. Sandberg's experiments on the oxidation of Bandrowski's base with hydrogen peroxide in the presence of catalase seem to show a splitting-up of the compound, but he does not feel too sure of the meaning of the results he obtained. A definite explanation of this reaction— whether it be oxidation, hydrolysis, or something else— would mark an important contribution to our understanding of the *p*-phenylenediamine oxidation cycle. It is possible that the splitting-up of Bandrowski's base can account for the considerable range of melting points attributed to this compound by various investigators, from a low value[7] of 230–231°C. to a high value of 244°C.[8].

(3) Oxidation of *p*-phenylenediamine in fairly acid medium or in fairly alkaline medium involves partial hydrolysis of the quinonedi-imine, probably giving rise to *p*-benzoquinone. Deamination in acid medium has been studied by Willstätter and Meyer[9], Erdmann[10], Willstätter and Piccard[11], and Fieser[12]. On the alkaline side, the deamination reaction has been studied by Cameron[13] and Tong[14]. In the work of Cox, previously cited[5], ammonia formation as the result of alkaline deamination accounted for 9% of the *p*-phenylenediamine used, with an equivalent quantity of quinone produced.

Erdmann[15], in his first explanation of dye formation by the oxidation of *p*-phenylenediamine, assumed the formation first of *p*-benzoquinone, then of a molecular compound of the quinone with *p*-phenylenediamine. Such a compound can be obtained by mixing solutions of equimolecular quantities of *p*-benzoquinone and *p*-phenylenediamine, as a dark brown substance quite insoluble in water and most solvents, without a definite melting point up to and above 300°C. By analogy with other known reaction products of *p*-benzoquinone and aromatic amines, the compounds of *p*-benzoquinone and *p*-phenylenediamine may be represented by the formulae—



2-*p*-Aminoanilino-1:4-benzoquinone



2:5-Bis-*p*-aminoanilino-1:4-benzoquinone

It is more than probable that the oxidation products obtained by oxidation in acid medium, which Mr. Sandberg found to have melting points above 275°C., were compounds of this type.

(4) Mr. Sandberg suggests that the use of catalase in the dyebath with *p*-phenylenediamine and hydrogen peroxide tends to accelerate the further oxidation of Bandrowski's base, and the use of metal salts, such as those of chromium or copper, generally applied to the furs prior to dyeing, would not be necessary. In the first place, the further oxidation of Bandrowski's base seems to lead to undesirable shades in dyeing, as was pointed out above. Secondly, it would appear that the actual colouring matter is most probably Bandrowski's base itself, and not a further oxidation derivative of Bandrowski's base. The objective in oxidation dyeing with *p*-phenylenediamine would thus appear to be the maximum production of Bandrowski's base fixed by the fibres. Thirdly, it has been pretty well established and accepted that the simple oxidation process with *p*-phenylenediamine and hydrogen peroxide is quite inefficient, as much as 50–70% of the *p*-phenylenediamine remaining unconverted after 24 hr. of reaction. In order to increase the efficiency of the process and thereby attain more intense and faster dyeings, it is customary practice to treat the furs with a salt of chromium, copper, or iron before entering into the dyebath. The action of the metal compounds varies with the specific metal used, either as auxiliary oxidant, catalyst, mordant, or a combination of these. Catalase, on the other hand, is an enzyme, or organic catalyst, characterised by great efficiency in decomposing hydrogen peroxide. The rapid liberation of oxygen from the peroxide in the dyebath would not at all be effective in the efficient oxidation of *p*-phenylenediamine. On the other hand, the presence of another enzyme, peroxidase[16], will promote the oxidation of the

intermediate by the peroxide efficiently and rapidly, without any decomposition of the peroxide. Both catalase and peroxidase are complex organic compounds containing iron, although in different states. In certain rare cases, catalase has acted as a peroxidase. Such seems to be the situation when Mr. Sandberg achieved a peroxidase-type reaction between Bandrowski's base and hydrogen peroxide in the presence of catalase. It would be of interest to study a similar reaction using peroxidase instead of catalase.

(5) The experiments with paper electrophoresis disclose the presence of at least five distinct compounds among the oxidation products of *p*-phenylenediamine. A similar separation can be made by paper chromatography. On the other hand, polarographic experiments seem to involve only two of these compounds, presumably those which are susceptible to oxidation–reduction reactions.

Mr. Sandberg is to be commended for pioneering the use of new methods for the study of reactions in oxidation dyeing. It is to be hoped that he will continue his experiments in this field, and at the same time avail himself of all the relevant background material, which would enable him to make better-informed interpretations of his results.

WILLIAM E. AUSTIN

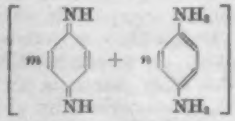
2446 UNIVERSITY AVENUE
NEW YORK 68, N.Y.
U.S.A.

5th September 1956

I have read with great interest the critical comments made by Mr. W. E. Austin on my paper [1], and will try to meet his requirement of clarification by replying as follows—

(1) The introductory section of the paper stated explicitly that, as earlier investigators in this field had dealt with the problem mainly from the preparative point of view, there are still some questions left that may be of interest to a fur dyer. The paper makes no claim to widen our knowledge of the constitution of these oxidation products to any very large extent. But, in any case, earlier work must form a basis, and I greatly appreciate the very informative list of references, and regret that the papers by Sunde and Lauer [2] had escaped my attention.

In connection with Green's proposed stepwise formation, I think it well worth mentioning Willstätter and Piccard's theory [17] of the formation of semiquinones of the type—



($m + n = 3$), in which the quinoid state is extended to the whole molecule and in which dynamic equilibria predominate, constitutionally explained by partial valence forces.

Furthermore, there must be difficulties in obtaining by means of polarography a clear and definite picture of the different oxidation states as listed in Green's stepwise scheme, because the structures IV, VI, VII are closely connected constitutionally (III and V are probably not reducible polarographically), and therefore possibly their half-wave potentials will be very close to each other; thus the waves will more or less coalesce, even if this drawback could be overcome by using derivative polarography or, as a second possibility, complex formation.

(2) Mr. Austin claims that I alternately accept and doubt the idea of azine formation, but I cannot find any statement in my paper throwing doubt on azine formation, even though no definite proof of the azine configuration is presented, which could not be expected by using polarography. In a private communication Dr. B. Lustig, of the Lawrence Richard Bruce Biochemical Laboratories, Stamford, Conn., U.S.A., has suggested that azine formation might be possible only in the presence of protein fibre. Therefore I merely wish to draw attention to the well known facts that beef-liver catalase consists of protein, haematin, and a second prosthetic group which is decomposed by acetone and hydrochloric acid. Parenthetically, the prosthetic group is inactivated by the presence of pyridine into pyridine haemochromogen, and the reaction of Bandrowski's base with hydrogen peroxide and catalase is completely suppressed when stock solutions of Bandrowski's base in pyridine are used. This is why dioxan was used instead of pyridine in these experiments. Furthermore, catalase contains, in addition to haematin, verdohaematin linked to the protein part of the molecule. The verdohaematin differs from haematin in that one >CH– group has been replaced by >O and –OH. It is of course extremely difficult, without further investigation, to conclude whether the protein part, with its associated haematin and verdohaematin, plays any significant part in the reaction discussed, and perhaps the comparison between protein represented by the keratin of wool fibre and protein represented by catalase protein is a little irrelevant.

2(*a*) To this section of Mr. Austin's comments I should like to add that the relative humidity plays an important rôle in the rate of the change of black to red, a matter which has been thoroughly investigated under controlled conditions in this laboratory. However, as far as dyeing sheepskins and beaver lamb black is concerned, the oxidation dyes are today of minor importance, owing to the introduction of selected acid dyes and Ursatin (BASF) brands.

(3) Regarding the splitting up of Bandrowski's base, I want again to stress the fact that I have left the question open whether *p*-phenylenediamine is re-formed or not, because of the comparatively large difference between $E_{\frac{1}{4}}$ for the single *p*-phenylenediamine wave and that for the anodic wave arising in the catalase-treated solution and also because of some other observations mentioned in the paper. These are the only relevant experimental facts so far, as I have intentionally avoided

any preparative isolation to identify the products formed. The reaction between peroxidase and Bandrowski's base has also been studied, but no decisive results have been obtained yet.

(4) I have suggested that the further oxidation of Bandrowski's base could be effected without applying copper or chromium salts, but I have *not* suggested the omission of these salts in technical fur dyeing, because of the considerable loss of fastness to light and storage if no mordant is applied. I do not agree with any statement made by Mr. Austin in this section, for the following important reasons—

(*a*) For each molecule of *p*-phenylenediamine oxidised a molecule of hydrogen peroxide is formed, so that the dyebath to a certain extent supplies its own peroxide. The formation of hydrogen peroxide by the action of molecular oxygen is very easily proved by polarographing an air- or oxygen-blown solution of *p*-phenylenediamine. The irreversible and extended wave which arises disappears completely on the addition of catalase.

(*b*) It should be observed that the decomposition of Bandrowski's base continues even when peroxide can no longer be detected (about 5–10 min. after the catalase addition), in accordance with the experiments described in the paper.

(*c*) In this factory skins are dyed with oxidation dyes on a commercial scale in 10 min. or less for light and medium dyeings (which normally require 1 hr. or more) by using catalase extract with a small excess of hydrogen peroxide, added at an appropriate rate to the dyebath. I think that Mr. Austin will admit that this is a very important fact, playing a certain rôle in a factory processing about 10,000 sheepskins a week, of which about 40% are dyed with oxidation dyes.

(5) Separation by chromatography or paper electrophoresis is, of course, a question of the experimental conditions, and in this case, in combination with polarography, it seems to be very convenient to get the different fractions collected at the drip points dissolved in the supporting electrolyte used.

In conclusion, it must be added that, since comparatively few investigators have dealt with the problems in this field, the contribution from this laboratory is not to be considered in any way conclusive or rigorous. Further investigations are being made, the results of which it is hoped to publish.

G. SANDBERG

SKANDINAVISK PÄLSBEREDERI & FÄRGERI AB.
SVENLJUNGA
SWEDEN

25th September 1956

[1] Sandberg, G., J.S.D.C., **72**, 227 (May 1956).
[2] Sunde and Lauer, *J. Org. Chem.*, **3**, 261 (1938); **17**, 609 (1952).
[3] Green, *J.C.S.*, **103**, 933 (1913).
[4] Austin, *Principles and Practises of Fur Dressing and Fur Dyeing* (1922, 1932).
[5] Cox, *Analyst*, **59**, 3 (1934).
[6] Austin, *J. Technical Assocn. Fur Industry*, **6**, 127 (1935).
[7] Bandrowski, *Ber. deutsch. chem. Ges.*, **27**, 480 (1894).
[8] Forster and Soyka, J.S.D.C., **47**, 99 (1931).
[9] Willstätter and Meyer, *Ber. deutsch. chem. Ges.*, **37**, 1494 (1904).
[10] Erdmann, *ibid.*, **37**, 2906 (1904).
[11] Willstätter and Piccard, *ibid.*, **41**, 1473 (1908).
[12] Fieser, *J. Amer. Chem. Soc.*, **52**, 4915 (1930).
[13] Cameron, *J. Phys. Chem.*, **42**, 1217 (1938).
[14] Tong, *ibid.*, **58**, 1090 (1954).
[15] Erdmann, *Z. angew. Chem.*, **14**, 424 (1895).
[16] Weisskopf, *Dyer*, **89**, 11 (1943).
[17] Willstätter and Piccard, *Ber. deutsch. chem. Ges.*, **41**, 1462 (1908);
Michaelis, Schubert, and Granick, *J. Amer. Chem. Soc.*, **61**, 1981 (1939);
LuValle, Glass, and Weissberger, *ibid.*, **70**, 2223 (1948).

"Man-made"

In his letter about the above term, Dr. Heaton [1] described it as a hyphenated horror, and asked why the familiar *artificial* should not be used.

Over thirty years ago, the term "artificial silk" was in common use by technologists and merchants, but it was soon shortened to the ugly "art-silk", and even abbreviated further to "silks" as a generic term, which caused great misunderstanding and confusion. It was with some relief that the trade welcomed the term *rayon*, which was put forward in 1924.

This word, however, has come to be closely linked with regenerated cellulose, and some manufacturers of cellulose acetate fibres stated that their products were not rayon; this was unfortunate, for it prevented the universal use of terms such as *viscose rayon*, *acetate rayon*, and so forth. The position was complicated further by the introduction of the synthetic fibres, for nylon is a generic term and not a trade name. There was also a tendency to call all fibres, other than the native fibres, synthetic, and to make use of the ugly term "synthetics" as a collective noun, thus ignoring synthetic dyes, synthetic rubbers, and synthetic résins.

Even though there is much in Heaton's suggestion of *artificial*, it has been tried and found wanting: the strict definition of being made by artifice is overshadowed by the association with spurious, counterfeit, and unnatural, as mentioned by Mr. Cady [2], but this type of association is less strong with "synthetic" (except for "synthetic" blondes, who are in fact artificial).

The term "man-made" may be ugly and horrible; it is also counterfeit, spurious, and unnatural. It is certainly not necessary to surround a serious industry with glamorised baby-talk, in view of the existence of the simple and dignified word *manufactured*. Hence, instead of "man-made" and "God-made" (?), we have the *manufactured* and the *natural* fibres.

Those who object to the use of "man-made" have an alternative which could be employed by all technologists; the difficulty of persuading the selling community would be much greater, for the American tendency to glamorise things is now an inherent part of promotion (as in the word *promotion* also). It is believed that "man-made" originated here, for as long ago as 1927 there was a series of articles in the Saturday store-promotion issues of the American paper *Women's Wear Daily* on the "Selling Points of Rayon and other Man-made Fibres".

A second and more important matter is to find some simple generic word which can be applied to all the manufactured fibres, in the way that was originally intended with "rayon".

The word *manufil* appears to have much in its favour, for it is simple, pleasant, euphonious, and self-explanatory; its Latin roots should appeal to the etymologist and make it acceptable in many different countries, some of which may boggle at "man-made" as a debasement of international terminology.

J. T. Marsh

1 Bower Road
Hale
Cheshire

17th October 1956

Heaton, J. S., J.S.D.C., **71**, 403 (1955).
Cady, W. H., *ibid.*, **71**, 609 (1955).

Notes

Presentation of Perkin Medal to Mrs. Helen Carothers

On Monday, 10th September 1956, in the Waldorf–Astoria Hotel, New York, Mr. Clifford Paine (President of the Society) presented to Mrs. Helen Carothers the Perkin Medal awarded posthumously to her husband, Dr. Wallace H. Carothers, for the discovery of nylon.

Alfred Waddington A.S.A.A. Honorary Treasurer of the Society

At the meeting of Council held on 2nd May 1956 Mr. A. Waddington was appointed Honorary Treasurer of the Society. Mr. Waddington was

educated at Bradford Grammar School, and qualified as an Incorporated Accountant in 1925. He joined Mortimer Peel & Co. Ltd., a Bradford firm of wool dyers, in 1935 as accountant, and since 1939 has been a director of the same firm.

Election of Fellows

At the meeting of Council held on 7th November 1956 the following were elected Fellows of the Society —

Thomas Hill
(*Leek, Staffordshire; General Manager, William Hammersley & Co.*)

Alec Murray
(*Cleckheaton, Yorkshire; Head of the Technical Service (Textile) Department of the Kirkstall Road branch of the Yorkshire Dyeware & Chemical Co. Ltd.*)

Scottish Junior Branch

At its meeting on 7th November 1956 Council gave formal approval to the proposal to form a Scottish Junior Branch of the Society at the Paisley Technical College.

Meetings of Council and Committees November

Council— 7th
Finance and General Purposes— 7th
Diplomas— 7th
Colour Index Editorial Panel— 14th and 30th
Light Fastness Subcommittee— 15th
Publications— 20th
Symposium Committee— 21st.

Deaths

We regret to report the loss by death of Mr. A. Corradi, Mr. F. S. Holland (who had been a member for sixty years), Mr. J. L. Lord, and Mr. R. B. Whitehead.

Price of the *Journal*

Owing to increased charges for paper, printing, and administration, the Society has been reluctantly forced to increase the price of the *Journal* to non-members (subscribers) from £4 0s. 0d. to £5 5s. 0d. per annum including postage. The new rate operates from 1st October 1956 for new subscriptions, or from the date of expiry for existing contracts.

The rates of membership subscription remain unchanged.

I.S.O. Conference on Colour Fastness Tests

A further conference of ISO/TC 38/SC 1 was held at New York on 5–7th September 1956. The

countries represented were Belgium, Canada, Czechoslovakia, France, Germany, Japan, Switzerland, the United Kingdom, and the U.S.A. Russian delegates were delayed and did not arrive until the end of the conference, but they had informal talks with other delegates during the following week.

The U.K. delegation comprised Dr. P. W. Cunliffe (Chairman of the Society's Fastness Tests Co-ordinating Committee), who acted as leader, Mr. K. McLaren (Honorary Secretary of the F.T.C.C.), and Mr. G. B. Angus and Mr. E. Wilson (members of the F.T.C.C.).

The following tests, with some minor changes, were raised from the tentative stage to the status of Draft I.S.O. Recommendations—

Alkaline milling
Acid felting: severe
Acid felting: mild
Cross dyeing: wool
Decatising
Degumming
Bleaching with sodium chlorite.

Two new tentative tests were agreed upon—

Cold vulcanising
Hot vulcanising.

It was decided that the following tests should be discussed further by correspondence, and working groups were set up to deal with them, to be convened by the countries indicated—

Sublimation in storage (U.K.)
Steaming (U.K.)
Daylight (Canada)
Washing (Canada).

Of the other tests, two would also be further discussed by correspondence—

Perspiration
Burnt-gas fumes.

Fuller accounts of the positions which have arisen in connection with the Light and Washing Tests are given below.

LIGHT FASTNESS TESTING

The AATCC informed the conference that they could not accept the I.S.O. Daylight Test in its present form, since this would render obsolete the extensive data which had been obtained by means of their existing test, which differs fundamentally from the I.S.O. test. They therefore asked that acceptance of the I.S.O. test should be deferred and that at a later date two tests (European and American) should be submitted for acceptance simultaneously.

This would have entailed considerable delay, however, because the existing American method has recently been severely criticised by an investigating committee of the AATCC. It seems likely that they will wish to devise a new method in which the amount of light falling on the pattern will be measured by means of a pyroheliometer. Such a method would differ considerably from existing European practice, in which dyed fastness standards are used. The European delegates felt that their common views should be formally recognised by I.S.O. The test was therefore accepted as an I.S.O. Recommendation by a majority vote, and will be adopted as a national standard by all members other than the U.S.A. As soon as a suitable American daylight test has been devised, it will be submitted to I.S.O., and will become a Recommendation applicable only in the U.S.A.

The American delegation enquired whether a fading-lamp test would be acceptable to the European delegates, to which the British delegation replied that the use of an enclosed carbon arc lamp would be rejected because of the well known defects of such lamps. A lamp which was based on a xenon arc would, however, be carefully considered, as they regarded the development of an international test as most desirable. These views were fully endorsed by the other European delegates present.

FASTNESS TO WEATHERING

A test based on the work published in October 1955 (J.S.D.C., **71**, 587) was accepted for consideration by other members.

WASHING TESTS

Considerable discussion took place on the tests for colour fastness to washing, both within a working group and in full conference. The U.S. delegates made it clear that they were not able to accept the existing I.S.O. proposals. Some of these had been tabled at the previous meeting of Subcommittee 1 in 1954, while others were of more recent origin.

Eventually it was decided that the procedure which was most likely to lead to ultimate agreement was to draw up a classification of washing methods and then to determine the most appropriate test for each class. The categories were defined as follows—

(1) By hand at 35–40°C.
(2) Mildest machine laundering
(3) Intermediate machine laundering
(4) Vigorous conditions and high temperature
(5) Most severe conditions.

Although agreement was reached in this way on wash categories, the difficulty of selecting the appropriate tests remained, the U.K. and the European Continent adhering to the existing I.S.O. proposals, whilst the U.S.A. wished to retain their own AATCC tests.

It was decided that the working group under Canadian leadership should remain in existence and should exchange views and report at the next meeting of Subcommittee 1.

P.W.C.

International Federation of Associations of Textile Chemists and Colourists

The Fourth Congress of the I.F.A.T.C.C. was held in Florence on 18–20th September 1956 and was attended by Mr. J. Boulton, Mr. A. S. Fern, Mr. Fred Smith, Mr. E. A. Swift, Dr. T. Vickerstaff, and Mr. G. S. J. White as official delegates from the

Society. The total attendance was estimated at 500–600, including 10 from Great Britain, 109 from France, and 77 from Italy. Members were supplied with a special issue of the *Bolletino della Associazione Italiana di Chimica Tessile e Coloristica* containing summaries of all papers in French, German, Italian, and English with space for note-taking.

At the inaugural meeting on the Wednesday morning, September 19th, Mr. J. Boulton, representing the President of the Society, conveyed greetings from the latter (who was then in New York attending the Perkin Centennial), and stressed the international character of the Society: of some 2,500 members, 500 are overseas members residing in 38 countries, and the *Journal* is purchased in 46 countries. This was the first formal appearance, at a Congress of the International Federation, of a delegation from the Society as an affiliated body. Mr. Boulton conveyed a tentative invitation from the Society for the Fifth Congress to be held in London in 1959.

Meetings were held in the ancient Palazzo Vecchio, a total of nine papers being given. The papers were presented in full, and there was no opportunity for discussion.

The social programme included an open-air assembly on the Piazzale Michelangelo, a symphony concert, a banquet and ball, and an excursion to Siena.

At a meeting of the Delegate Council held on the Tuesday evening at 9 p.m. a proposal of the Society's delegation was accepted that each country should be represented by six delegates, instead of the original arrangement of each constituent body appointing one delegate per one hundred members.

Dyers and Finishers Association, Cape Town

The Association was inaugurated on 20th April 1955, with Mr. F. Travis as chairman, Mr. R. Hill as secretary–treasurer, and three other committee members—Messrs. J. R. Murdoch, H. Sedgewick, and H. Vetter. The first meeting was held on 18th May 1955, with a lecture on Terylene by Mr. A. Reveley. A meeting at Paarl, about 40 miles from Cape Town, held on 28th June 1955, failed to attract local members, and the idea of holding country meetings was reluctantly abandoned. On 15th September 1955 an interesting lecture on the *Processing and Dyeing of Furs* was given by Mr. U. H. Dienstmann, an expert on the treatment of karakul skins. The programme included also other lectures, two film shows, and a dinner–dance.

At the Annual General Meeting, held at the end of April 1956, Mr. H. Vetter became chairman, and Mr. Sedgewick was replaced on the committee by Mr. R. Lundie and Mr. E. Schaffner. During 1956–1957 lectures were to be held at approximately six-weekly intervals throughout the year.

Swedish Technical Dyers' Association

The Annual Meeting of Svenska Färgeritekniska Riksförbundet was held during 17–20th August 1956 in Jönköping, a town chosen because of its central situation rather than any association with the textile industry, which has been the basis of selection of the meeting place in previous years. Despite this, the conference was well attended, some eighty delegates (including ladies) from dye-using and dye-manufacturing industries being present, including several visitors from overseas. Organised activities during the one-and-a-half days' duration of the conference included lectures by representatives of Ciba Ltd. and Farbwerke Hoechst AG. reviewing new developments in the dyeing of wool and synthetic fibres and in bleaching processes respectively. Tours of local factories were also arranged, a visit to a modern garment-making organisation being particularly impressive.

At the formal dinner the President (the newly elected Mr. Sjoklint) built his speech around the discovery of Mauve, and the lilac-tinted menu contained an insert briefly summarising the life and the work of Perkin. Mr. R. W. Speke conveyed formally the good wishes of the Society of Dyers and Colourists, a sentiment which was heartily reciprocated by the President and the Council of S.F.R. R.W.S.

Oil and Colour Chemists' Association Symposium on "Some Implications of Colour"

The 1956 O.C.C.A. Symposium was held at University College, London, on September 20th, three papers being presented during the morning, and the afternoon being devoted to discussion. It is intended to publish the proceedings in the Association's *Journal* early in 1957.

The first paper, by E. Atherton and D. Tough (presented by the latter), dealt with *Colour Gamuts of Pigments*. The relation between the colour purity of the paint and the relative amounts of coloured, white, and black pigments was discussed. Methods were described by which the colour of a paint sample might be represented by an idealised reflectance curve and the colour performance of the pigment in reduction calculated, particular attention being paid to the effect of additions of black pigment in producing high intensity of colour. This paper was rather theoretical and concerned largely with colour physics, so that understanding will no doubt be easier when the written paper can be studied at leisure.

The second paper was probably of greater direct interest to members of the Society, for it dealt with the *Assessment of Light Fastness*. Dr. J. G. Gillan presented an interim report on the results of a co-operative investigation being undertaken by the Association's Light Fastness Committee to ascertain whether the blue wool standards prepared by the Society (*B.S.* 1006) are applicable to the assessment of the light fastness of paints. It was interesting to learn from him that the so called "madder scale" is not really a scale at all. The possibility of using *B.S.* 1006 had been fully discussed at meetings of local sections of the Association, and on the whole a favourable opinion had been expressed. The current investigation comprised two projects, in the first of which

members had been asked to assess the fading of a number of already exposed painted panels against *B.S.* 1006. The first 73 results showed satisfactory agreement between different observers for some panels, but not for others, especially those which had "faded" to a deeper colour (the speakers did not seem to regard this as a contradictory use of the verb *to fade*). In the second project members had been asked to expose a set of red, blue, and green panels and to assess the fastness of the panels at various stages of exposure, assessments to be made individually and by groups of ten members. The results showed good agreement for the red panel and a wide spread with the blue panel, the green panel being intermediate.

The discussion on this paper showed the lively interest of members of the Association in *B.S.* 1006, and brought out the fact that some familiarity with the test was necessary before the full implications of the 1–8 scale and the use of grey scales could be appreciated. Dr. C. J. W. Hooper (Editor and Technical Officer of the Society) was able to stress the detailed work— both experimental and statistical— undertaken by the Society since 1927 in working out methods of light-fastness testing, and to point to the advantage of having one method of test applicable to several industries as well as in several countries. He was able also to answer questions "from the floor" on the possibility of fading Standard 8 and on the use of fading lamps.

In the third paper Mr. M. Hess discussed *Personal Experience with the Inter-Society Color Council Aptitude Test*. This test had been devised by an American colour psychologist for assessing an individual's power of colour discrimination and his ability to match colours. The total cost of the equipment is about £60. The essential part consists of a total of 48 chips showing 10 steps each of 0.2 Munsell chroma difference in four different colours (the first two chips in each series do not count towards the final score). These have to be matched under standard viewing conditions. Dr. H. W. Ellis (Chairman of the London Section of the Society) consented to be a guineapig by subjecting himself to the test.

In a short speech M. Azens (Président d'Honneur de la Fédération Internationale des Associations de Techniciens de l'Industrie des Peintures, Vernis, Émaux, et Encres d'Imprimerie de l'Europe Continentale) outlined the work which F.A.T.I.P.E.C. was undertaking. This was concerned with practical and theoretical aspects of colour matching and basic principles of terminology. The Belgian A.T.I.P.E.C. had set up four committees, to deal with apparatus, terminology, tolerances and physical definitions, and standardisation of pigments.

British Colour Council Silver Jubilee

Celebration of twenty-five years of work on the standardisation of colours and their names by the B.C.C. began at 13 Portman Square, London W.1, on Monday, 24th September 1956, with a reception by the President, Sir Ernest Goodale, C.B.E., M.C., and Lady Goodale and an exhibition, *A Story in Colour*, which was kept open until September 28th, and subsequently re-opened during October 10–25th.

On the Tuesday morning Mr. R. J. Smith, F.T.I., spoke on *Colour through History*: dyeing was certainly carried out in China as early as 3000 B.C., and the art gradually spread through Egypt and Asia Minor to Continental Europe and Britain. Mr. Smith recommended a paper, *Common Practices of Dyeing*, presented by Sir William Petty to the Royal Society in 1667, and he showed how such social phenomena as puritanism and the Restoration affected the demand for colour. Perkin's discovery in 1856 introduced dyes on a mass scale, but the faster types of dyes were not discovered until the twentieth century: of six major discoveries in dyemaking during the past thirty-five years, four originated in Great Britain.

In the afternoon a panel of experts answered questions on the subject *Colour over the Counter*. In the course of the discussions it was stated that fastness was the biggest colour problem concerning the shopper, and it was suggested that American colour advertising was better than British.

The guest of honour at the Silver Jubilee Dinner on the Tuesday evening was the Right Honourable Earl Woolton of Liverpool, P.C., C.H., a founder member of the B.C.C. Mr. A. H. Brewin (Prime Warden of the Worshipful Company of Dyers) replied to the toast of the guests.

On the Wednesday morning Mr. John Cavanagh, a member of the Incorporated Society of London Fashion Designers, spoke on *Colour in Fashion*, and during the ensuing discussion he expressed his willingness to co-operate with dyers and manufacturers.

The final session was devoted to *Colour Appeal*. Under the chairmanship of Dr. H. A. Thomas a panel of experts, representing dyemaking (Dr. T. Vickerstaff), dyeing (Miss Esmée Smith), and textile, fashion, and interior designing, answered questions. In reply to one question it was suggested that the production of novelty fabrics should be encouraged, even if the colour range was limited, possibly temporarily, by technical difficulties. Dr. Vickerstaff said that reds and yellows were probably as bright as possible, but future developments might well improve the brightness of greens and purples.

Proceedings of the Chemical Society

From January 1957 the *Proceedings* will be issued separately from the *Journal of the Chemical Society*. It will be greatly increased in size and will include lectures, obituary notices, news items, occasional articles, official announcements, and short scientific communications, which are sufficiently urgent or important to justify accelerated publication. The object of the communications should be to share knowledge, not to claim priority or reserve a field; polemics would not be acceptable.

Royal College of Science and Technology, Glasgow

The Royal Technical College, Glasgow, has been renamed the Royal College of Science and Technology, Glasgow. This has been done to indicate

that the college is one of the leading British technological centres and to mark Government designation of the college as one of the national centres to receive special development.

C.O.C.

Study of Polymer Science

In a brief note (*Chem. and Ind.*, 1077 (13th Oct. 1956)) Dr. M. Gordon suggests that, while the formation of polymers and their properties in dilute solution have been adequately taught, academic study of their bulk properties has been relatively neglected, although such properties are of great industrial significance. Dr. Gordon gives two examples of possible unifying concepts on which such teaching might be based—(i) the segmental relaxation rate, which determines the rate of crystallisation of such chain polymers as nylon and the deformation behaviour of polymers; and (ii) the influence of chemical structure on the second-order transition (between the low-temperature glassy state and the high-temperature rubbery state), which may be understood in terms of simple molecular packing principles (*ibid.*, 97 (28th Jan. 1956)).

1957 Symposium

The Society intends to hold a Symposium on *Recent Advances in the Colouring of Man-made Fibres* at Harrogate towards the end of September 1957. It is hoped that papers based on new research will be forthcoming from the Continent and America, as well as from workers in this country. Authors of suitable papers are asked to get into touch with The Editor, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire.

OBITUARY NOTICES

Herbert Levinstein

Dr. Herbert Levinstein, who joined the Society in June 1903 and read his first paper (on duty-free alcohol) to the West Riding Section in April 1903 [1], was for many years one of the best known personalities in the dye and chemical industries of this country. By his sudden death on 3rd August 1956 at Maidenhead, where he had recently removed from Upper Claydon near Bletchley, the Society loses one of its senior Past Presidents, who as recently as February 1949 [2] had shown in the first George Douglas lecture that he retained all the facility of exposition and wealth of illustration which he could bring at will to illumine alike a historical or a technical theme. One of the most moving moments in the recent Perkin Centenary Celebration was when, despite his lameness, he insisted on rising to propose, with all his old charm and courtesy, a vote of thanks to Mr. Clifford Paine for his lecture, and it was only fitting that he should live to attend the Centenary banquet, where he was the only survivor of those present at the Jubilee banquet in 1906.

Dr. Levinstein was born at Prestwich in 1878 and was educated at Rugby and at Owen's College, Manchester, where he obtained his M.Sc. with first-class honours in Chemistry in 1898 and studied chemistry under W. H. Perkin, Junior. He then took his Ph.D. at Zürich in 1900, and entered his father's firm at Blackley. The conditions at that time have been well depicted by the late Prof. A. G. Green in an address he gave to the Chemistry Section of the British Association at Glasgow in 1901, and he himself added a few glimpses in his address to the Society of Chemical Industry on receiving that Society's medal in 1931 [3]. For some two years Dr. Levinstein worked under Dr. C. Mensching, and was engaged in research on sulphur dyes, work which in 1902 issued in two British patent specifications [4]. The first relates to the manufacture of *m*-chloro-*p*-hydroxy-*p'*-aminodiphenylamine and sulphur dyes therefrom, and the second to the manufacture of blue sulphur dyes. In November 1907 he addressed the West Riding Section of the Society on the dyeing of wool fabrics with sulphur dyes [5], but the majority of the twenty-five British patent specifications standing in Dr. Levinstein's name relate to azo dyes and intermediates for such dyes, e.g. the preparation of secondary disazo dyes from derivatives of J acid [6], including the preparation of such derivatives as the glycine ester of this and other aminonaphtholsulphonic acids [7], and the glyceryl derivatives [8] and secondary disazo and trisazo dyes derived from 2-halogeno-5-naphthol-7-sulphonic acids [9]. Two other patents relate to monoazo dyes from dinitro-*o*-aminophenols [10], and there is a series of patents for trisazo and tetrakisazo dyes with

resorcinol as end-component, for aftertreatment with formaldehyde [11]. Besides monoazo dyes from resorcinol and its homologues [12], the patents cover disazo dyes from acryl-β-aminonaphtholsulphonic acids and resorcinol or its derivatives [13] and blue chrome monoazo dyes for cotton or wool [14]. There was in 1916 a joint patent with G. T. Morgan for the manufacture of *p*-amino-*N*-methylformanilide and for monoazo dyes from this [15]; in 1918 one for the manufacture of benzyl chloride, benzal chloride, and similar products by the action of aqueous hypochlorous acid on toluene at low temperatures [16]; and finally, in 1920, one for the manufacture of phenylglycines from tetrachloroethane or trichloroethylene and aniline [17].

About half of these specifications are jointly in the name of James Baddiley, who joined the firm in 1909, and although they cover the manufacture of the Vulcan range of azo dyes for aftertreatment with formaldehyde then marketed by Levinstein Ltd., and also of a range of direct cotton dyes fast to light, the main interest of Dr. Levinstein's work here lies less in its technical novelty or merit than in the association with the future Perkin medallist — whom our President described at the Perkin Centenary Banquet as Dr. Levinstein's chief discovery— and in its evidence of Dr. Levinstein's firsthand interest in research. That interest developed early and remained with him throughout his career. Only in a paper to the Association of Technical Institutions in 1923 [18] did that interest find specific expression, but in many of his addresses during and after the First World War he emphasised the dependence of the dye industry upon a vigorous research policy, though he never exaggerated its importance and always insisted that the magnitude of the research effort of a firm was determined by the success of the sales organisation: in an industrial firm the sales department and not the research department came first. Nevertheless, it was due to his efforts that a distinct research department was formed in his father's firm and that the nucleus was provided for expansion under the leadership of Prof. A. G. Green and Mr. J. Baddiley after the outbreak of war in 1914.

When Baddiley came to Blackley Dr. Levinstein had been works manager for two years, but he did not take over full responsibility for the firm until his father's death in 1916. Nonetheless, Dr. Levinstein played a leading part in organising the expansion of the firm to meet the demands which confronted the industry on the outbreak of war. The story of that effort has never been told in detail. Glimpses are given in some of Dr. Levinstein's addresses and in a pamphlet published by the firm shortly after the war, but it was probably in selecting and training his technical staff and giving them their opportunity that he set his most enduring mark upon the industry.

This may seem to disparage the work he did, not only inside the firm itself but on innumerable committees concerned with the wartime problems of the dyemaking and dye-using industries and in the reorganisation which issued in 1919 in the formation of the British Dyestuffs Corporation Ltd., of which he became joint managing director. This post he resigned in 1921, but he retained throughout his long life the affection and esteem of his staff, and no assessment of Dr. Levinstein's contribution to the renaissance of the dyemaking industry in this country can fail to take account of the way in which he won the affection and the loyalty of his staff, and inspired them with his own vision and enthusiasm. His approachability and courtesy to even the youngest recruit, the patience with which he would explain or discuss a problem, as well as his flair for going at once to its root, were characteristics which he retained to the end, and they found expression in the fresh fields which he entered when his official responsibilities in the dyemaking industry terminated.

How hard a blow it was for him when that connection ceased when he was 44 can be sensed from an address to this Society at Bradford in October 1924 [19]. He believed in the future of the industry and in that of the firm his father had founded and to which he was devoted. He strove to the end to preserve its independence, and he never concealed the fact that he agreed to amalgamation with British Dyes Ltd. only under the strongest government pressure. Later, in 1937, he founded in memory of his father's work the Ivan Levinstein Memorial Lecture at the Manchester Chemical Club, and whatever regrets Dr. Levinstein entertained, they were never allowed to obtrude. One who warmed both hands so gladly at the fire of life must have found some compensation in finding himself within the next ten years not only a Freeman of the City of London (1923) but also President of this Society (1927–1929), of the Manchester Literary and Philosophical Society (1924–1925), of the Society of Chemical Industry (1929–1930), and of the British Association of Chemists (1923–1924). Of this last body he was again President in 1949–1950, receiving the Hinchley Medal in 1953 when he delivered perhaps his last address on the chemical industries [20]. He was also President of the Institution of Chemical Engineers (1935–1937) and in 1947 Prime Warden of the Worshipful Company of Dyers (1947–1948). In 1933 he gave the Gluckstein Memorial Lecture to the Institute of Chemistry, in 1938 the Perkin Memorial Lecture to the Society of Chemical Industry and the Chemical Society [21], and his deep interest in the history of the dye industry and the wealth of personal reminiscence which he had at his disposal found expression as freely in the first George Douglas lecture, which he gave to this Society in 1949, as it had done in 1931. In 1944 he was elected Chairman of the Society's Fastness Tests Committee.

Dr. Levinstein was not only an accomplished lecturer who commanded attention in the general as well as in the technical press. In speaking on chemical industry, he could draw on first-hand experience of the rayon industry and the salt and soda industry, as well as of the dyemaking industry. He was interested in the development of rayon from the start and was an original director of the Nuera Art Silk Co. Ltd., and from 1928 a technical director of Lansil Ltd., and this interest is reflected

in his presidential address to the Society of Chemical Industry[22] as well as in a lecture to the Institution of Chemical Engineers in January 1930[23]. His last paper, *The Raw Materials for Rayon*, was read before the Manchester Section of the Society of Chemical Industry in February 1948[24]. In this presidential address may equally be seen the germ of the idea which he brought to fruition only in 1950, when the Murgatroyd Salt & Chemical Co. Ltd. began to produce salt at their Elworth factory by modern triple-effect vacuum evaporators, and where back-pressure turbines operating with high-pressure steam are installed, the electrical energy so generated being used for the production of caustic soda, chlorine, and chlorine compounds. Ivan Levinstein had acquired an interest in Murgatroyd's Salt Co. early in the century, and Dr. Levinstein was for many years technical director, being made Life President in 1950 in recognition of his work in promoting the Elworth Scheme. He also had interests in a soda ash works at Plumbley and at one time in the Magada Soda Co., while from December 1941 to June 1946 he was technical director of Williams (Hounslow) Ltd.

Like his father before him he was keenly interested in patent law, and some of his most notable lectures dealt with various aspects of patent law, for instance his address to the Bristol Section of the Society of Chemical Industry in October 1929[25], his contribution to the Jubilee Number of our *Journal*[26], and his presidential address to the Institution of Chemical Engineers in March 1936[27]. He was a member of the Chemical Warfare Committee 1917–1919 and of the Hartley Mission to Germany to examine the production of explosives and of poison gas as well as of the Economic Section of the Peace Conference in Paris, and could thus draw on first-hand knowledge in lecturing on chemical disarmament[28].

It is, however, when, as in his presidential addresses to the Manchester Literary and Philosophical Society and the Society of Chemical Industry, and in the George Douglas lecture, Dr. Levinstein takes a broader theme and the clarity of his mind is displayed against a background which allows him to do full justice to his wide reading and rich culture, that the qualities which made him such an outstanding speaker can be fully appreciated. *Philosophy in the Market Place*[29] and *But an Apprentice in Nature's Workshop*[22] display the philosopher as well as the vision and the realism of the leader of industry.

It must be a matter of profound regret that, freely as Dr. Levinstein gave his help to those who sought to illumine some chapter of the history of the dyemaking industry, he never recorded systematically his own experiences and reminiscences, though he had promised to assist at least one history of the industry. He has left instead a host of colleagues whose lives are the richer for his counsel, his inspiration, and his vivacity, and whose memories recall incidents of his generosity and his imagination, and the anecdotes of his experience, which he could recount with such vivacious charm. Nor would any record of him be complete which did not refer to his versatility outdoors as well as in. A keen rugger player, who played wing three-quarter for Owen's College, and a mountaineer in his youth, in later life he found recreation in hunting and yachting, and only a few weeks before his death in swan-upping. He was a member of the Royal Thames Yacht Club and at one time a Master of Hounds, and even a serious accident which disqualified him from serving as a private in the Home Guard did not altogether keep him from the saddle. The courage with which he faced such misfortunes enhanced the respect with which he was regarded throughout the industry and the profession.

R. BRIGHTMAN

[1] J.S.D.C., **19**, 219 (1903); he had earlier published a note on indigo, *ibid.*, **17**, 138 (1901).
[2] *Ibid.*, **65**, 269 (1949).
[3] *J. Soc. Chem. Ind.*, **50**, 251 T (1931).
[4] *BP* 7,871 (1902), 12,229 (1902).
[5] J.S.D.C., **23**, 296 (1907).
[6] *BP* 23,992 (1909), 14,448 (1910), 15,068 (1910), 12,281 (1911).
[7] *BP* 11,877 (1910), 26,577 (1910).
[8] *BP* 15,070 (1910).
[9] *BP* 15,069 (1910).
[10] *BP* 3,457 (1911), 9,574 (1912).
[11] *BP* 27,525 (1912), 28,296 (1912), 1,435–6 (1913), 25,547 (1913), 28,569 (1913).
[12] *BP* 3,427 (1913), 4,316 (1913).
[13] *BP* 8,569 (1914).
[14] *BP* 5,344 (1915).
[15] *BP* 111,321 (1916).
[16] *BP* 134,250 (1918).
[17] *BP* 173,540 (1920).
[18] *Nature*, **111**, 445 (1923).
[19] J.S.D.C., **40**, 349 (1924).
[20] *Chemical Practitioner*, **25**, 11 (1953).
[21] *Chem. and Ind.*, 1137 (1938).
[22] *Ibid.*, **49**, 303 T (1930).
[23] *Trans. Inst. Chem. Eng.*, **8**, 24 (1930).
[24] *Chem. and Ind.*, 537 (1948).
[25] *Ibid.*, **48**, 980 (1929).
[26] J.S.D.C., *Jubilee Issue*, 83 (1934).
[27] *Trans. Inst. Chem. Eng.*, **14**, 12 (1936).
[28] *J. Soc. Chem. Ind.*, **49**, 71 T (1930).
[29] *Manchester Memoirs*, **70**, 41 (1925–1926).

Allan George Tyler

The sudden death of A. G. Tyler on 28th August 1956, at the age of 51, came as a shock to his many friends, not only to those in the Midlands, where he was so well known, but also to those who knew him, and had worked with him, in his many activities. At the time of his death he was looking forward eagerly to returning from teaching to industry, and our deepest sympathy is extended to his widow, son, and two daughters in their bereavement.

He was a native of Stroud, receiving his early education at Marling School, from which in 1923 he obtained a Clothworkers' Exhibition to Leeds University, thus becoming one of a long line of boys proceeding from that school to the Department of Colour Chemistry and Dyeing, where they duly became active junior members of the Society. After graduating with honours, he undertook research work at Huddersfield Technical College, for which he was awarded his M.Sc.

His first post in industry was as chemist to Joshua Wardle Ltd. of Leek. In 1939 he accepted a similar appointment with Percy Andrew & Son

Ltd., of Nottingham, and in 1948 he joined the staff of the Nottingham and District Technical College as Senior Lecturer in Dyeing. To this work he brought a blend of industrial experience, academic background, and sympathy with his students which was to benefit so many from all parts of the world.

It was characteristic of Tyler that he preferred to take an active rather than a passive part in anything that interested him. He was a stalwart of the Midlands Section, having been a member of their committee since 1944. In 1952 he put a great deal of hard work into organising the Summer School at Loughborough. He was elected to Council in 1954, but it was as a member of the Executive Subcommittee of the newly formed Diplomas Committee, that is, during the formative stages of the Society's Diplomas Scheme, and later as a member of the Examinations Board, that he did his most valuable work for the Society. Through his efforts the Nottingham and District Technical College became one of the first to offer a course of study in dyeing leading directly to the Associateship of the Society.

He was a man of deep religious convictions, and was a devoted worker for the Baptist Church, in which he had held a number of lay offices. His other interest was music, and, possessing a powerful bass voice, he was an active member of the Nottingham Harmonic Society. He was both chorister and soloist, and could be relied on to contribute a rousing ballad at the Midlands Section annual dinners.

At a memorial service held prior to cremation on 1st September 1956, the minister of Arnold Baptist Church paid high tribute to his friendliness, devotion to duty, and loyalty to Christian principles. Those who were associated with him in his profession, and we who worked with him for the Society, bear witness that all were manifest in his daily life.

H. C. Olpin

Dr. T. M. Egger

The announcement on September 1st that Dr. T. M. Egger, of Basle, had died suddenly at Davos, following an operation from which he appeared to be well on the way to recovery, came as a great shock to his many friends in this country. Born in 1899 at Aarwangen, Egger studied Chemistry at the Federal Polytechnic in Zürich and subsequently obtained his degree at the University of Geneva under Professor Briner.

His inherent talents as a colourist developed rapidly, and these were allied to a sound chemical knowledge and the quality of leadership. On behalf of Ciba Ltd. he visited customers in Great Britain, the United States, Germany, and Poland. Thus he acquired extensive experience, and his remarkable fluency in foreign languages combined with his personal approach made him a natural ambassador. In 1955 he took over the direction of the Dyehouse Department in Basle as successor to the late Dr. E. Krähenbühl. He assumed his duties at a time of great activity in the erection of new buildings, which called for extensive reorganisation, and in this capacity he justified again the confidence which had been placed in him.

As an individual Dr. Egger was one who never failed to speak his mind freely, but his selflessness was so obvious and his innate kindliness was so well recognised that his comments rarely gave rise to offence. Those who had the privilege of knowing him either as a friend or as a colleague treasure the most pleasant and inspiring memories of the association.

New Books and Publications

Das Färben und Bleichen der Textilfasern in Apparaten

By P. Weyrich. 2nd revised edition 1956. Pp. viii + 321, + 113 illustrations in the text. Berlin, Göttingen, and Heidelberg: Springer-Verlag. Price, DM. 36.00.

Like the famous egg, parts of this book are excellent. They are the parts which deal with the plant available for the dyeing of loose fibres, slubbing and sliver, and yarn in various forms of wound package, by systems in which the liquor is circulated. Other systems of yarn dyeing are mentioned, but at much shorter length, and there is an absolute exclusion of all forms of piece dyeing, so that, if the prospective reader is not acquainted with the earlier edition, in which the same line was followed, the title may seem to be rather misleading. As may be indicated more fully later, the outlook is somewhat parochial, being confined almost entirely to German productions when dealing with dyeing plant, to German and Swiss dyes and auxiliaries, and to German winding machinery, with, however, recognition of Swiss and American achievements in this field. Also, Herr Weyrich seems to be much more at home in the procedures for dyeing and other treatments

applied to wool, and to be acting as a not too well informed reporter when dealing with the treatments of other fibres. Because German machinery makers have been specially happy in the design of dyeing systems for yarn and allied products, and are generally noted for their sound and careful work in the construction, the restrictions that have been mentioned are not felt seriously in the quite full and well illustrated sections which deal with the design and operation of the machines, the building of packages, and the multifarious designs for package centres and their grouping in the machine. In this section there seems to be only one rather serious shortcoming. For a book published in 1956, the account given of cake-dyeing methods is far too short. The special problems encountered in the handling of this kind of package are hardly mentioned, nor are the machines specially built for it, such as the Courtaulds–Longclose and the Enka systems. One useful modern development which does receive mention is the problem of drying, and both the high-speed drier of Kranz and the pressure drying system of Thies are described. While the problems created by migration of dye during attempts to dry wound packages rapidly are recognised, there is no mention of the difficulties caused by contraction of normal continuous-filament viscose rayon.

When the dyeing of yarn in hank form comes to be considered, the general treatment is much less full and detailed. There is in this field an opportunity, which has not been taken, of showing how far the various machines which dye hanks in the hanging state conform to, or depart from, the movements of hand-dyeing in the beck. There is, in fact, no illustration, and very little description, of the rotating roller machines of the Gerber type, although the author does detail the circumstances in which this method can be used and admits that there are still appreciable weights of yarn handled in this way. Here, as in the dyeing of hanks by packing in the cage of a circulating machine, the picture he gives seems to reflect a much less adventurous attitude among the dyers of cotton and viscose rayon yarns in Germany than obtains in this country. It is more likely, however, that it comes from some lack of experience in this field. Even though they are now almost obsolete except in some localities, for a wool-yarn dyer not to mention machines of the Klauder–Weldon type, with their many unusual features, seems to be a curious omission.

The study of machines of the Hussong type is fuller and more satisfactory, and includes systems in which units can be coupled in their circulation to enable larger batches to be dyed, but even here there is little indication of the very large capacities installed for the dyeing of carpet yarns.

The author has, quite wisely, decided to leave out detailed dyeing recipes, and with the continuous help that is available in most countries from the technical services of dyemaking firms, this kind of information in a textbook is of doubtful value when it does not illustrate principles. The colouristic material is much more satisfactory in dealing with wool than with cellulosic and other fibres. New developments such as dyeing under static pressures above atmospheric, and the cuprous-ion method for acrylonitrile fibres, are mentioned. Chapters on the theory of dyeing are not done very satisfactorily, and, in the few references given to scientific and technical literature, it is often a paper of secondary importance that is cited. One gets the impression that publications in the English language are causing linguistic difficulties, because American and English pioneers in some of the important fields covered scarcely receive any mention. A glaring error is in the attempted reproduction of the Society's classification for direct dyes, which is, in fact, confused with the Courtaulds temperature-range test. It is difficult to understand how anyone who had read the *Journal* could have committed this error. On the whole, therefore, although it probably justifies its place in a technical library, this book is not worth its high price as a personal possession.

H. A. Turner

Textiles and Testing: Course of Study

By the Consumer Service Group, United States Testing Co. Inc. Hoboken, N.J. 2nd edition 1955. Pp. v + 88. Price, $2.75.

The declared purpose of this publication is "to provide a practical guide on fibres, yarns and textile testing that are used in today's fabrics for students taking the annual textile course offered by the United States Testing Co. Inc.". It contains a good deal of general information on raw materials, fibre identification, yarn and cloth manufacture, testing, and analysis, and includes details of selected serviceability and performance tests and references to standard testing methods.

An interesting section is that dealing with the identification of dyes on textile materials. The methods described for examining dyeings on cellulosic and animal fibres are based on the familiar stripping and reduction and reoxidation techniques using ammonia, soap solution, dilute acetic acid, and Hydrosulphite BX as in Green's Tables. Unfortunately, no guidance is given for identifying dyes on any of the newer synthetic fibres, since it is stated that no tests are yet available. The suggestion that resin-bonded pigments may be detected by hand scrubbing in warm soap solution is unlikely to be adequate in the case of the newer preparations of this type.

The lay-out is attractive. Diagrams, photographs of testing equipment, and photomicrographs of fibres are included, and various woven and knitted structures are illustrated by small samples of fabric.

C. B. Stevens

A Textbook of Practical Organic Chemistry

By Arthur I. Vogel. 3rd edition 1956. Pp. xxvii + 1191. London: Longmans, Green & Co. Ltd. Price, 60s. 0d.

This well established textbook appears with considerable additions, and of necessity of increased size and price above the 1951 edition. Weighing 4 lb. 10 oz., of thickness 3¾ in., and with its orange dust-cover, it is not likely to be mistaken

or misplaced by the most absent-minded. However, its very size does now create a problem in student logistics. At the time of the first edition (1948) the many illustrations of apparatus, particularly new additions to laboratory practice, were highly desirable. Now that all these are available in the manufacturers' catalogues it would appear desirable, in order to allow further expansion of the preparations sections, to effect some drastic pruning in Chapter II, to allow such expansion without further increase in size.

As a concession to those users who find the "decimal" system of numbering confusing, there is now at the top of each pair of pages the "decimal" reference to the experiments appearing below.

The arrangement of the work is as in previous editions, with additions in most sections. Chapter VI (Miscellaneous Reactions) has been considerably enlarged, and now includes, amongst other new reactions, Oppenauer oxidation, Arndt–Eistert reaction, Michael reaction, Willgerodt reaction, syntheses with organo-lithium, -sodium, and -cadmium compounds, as well as ring-enlargements by means of diazomethane.

The sections on dyes, synthetic polymers, and physiologically active compounds, with only slight additions are still too small to have real value as self-contained sections. Brief notes on the specific physiological activity of those compounds described in Chapter IX would increase both the interest and the value of this section.

Additional theoretical considerations are now included, but occasionally the newer electronic mechanisms are in painful juxtaposition to older empirical rules (pp. 523–525). A real "howler" is perpetuated on p. 620, where azo pigments are again confused with azo dyes. The author is respectfully referred to the "Terms and Definitions" sections of this and allied technological journals!

There is no doubt that "Vogel" is still the best value for money in such a comprehensive one-volume practical organic textbook, and students and laboratory workers alike will look forward to further editions, revised as the ever expanding subject demands.

R. L. ELLIOTT

Annual Reports on the Progress of Chemistry for 1955

Volume LII

London: The Chemical Society. 1956. Pp. 467. Price, 30s. 0d.

Following the arrangement of last year, the subject-matter of the present volume is distributed among six sections, each of which is appropriately subdivided to allow for special discussion of outstanding discoveries.

GENERAL AND PHYSICAL CHEMISTRY— The noteworthy features of 1955 are dealt with in four subsections — *Kinetics of Chemical Change*, *Physical Properties of Gases, Liquids, and Solutions*, and *Colloid Chemistry*. The report on *Spectroscopy and Molecular Structure* reviews the literature on ultraviolet, infrared, Raman, microwave, and radio-frequency spectroscopy. It also deals with advances in electronic spectra, and discusses diatomic, simple polyatomic, and aromatic molecules and transition-element co-ordination complexes.

INORGANIC CHEMISTRY— Some of the most striking progress in this field has concerned hydrides and related compounds, especially the alkyl hydrides of aluminium, which are involved in some of the recent processes, due to K. Ziegler, for the polymerisation of olefins.

ORGANIC CHEMISTRY— As in 1954, one-third of the volume is devoted to this branch of chemistry. Phenanthrophenanthrene has been resolved, and becomes the first known optically active hydrocarbon whose asymmetry is due to overcrowding. Impressive progress has been made in the identification of naturally occurring amino acids and in the study of benzotropylium and allied cations, and in azulene synthesis. A brilliant two-stage synthesis of usnic acid from methylphloracetophenone has cast light from a new angle on the oxidation of phenols. The discovery of a mild method for the reduction of phenols to aromatic hydrocarbons fills a gap in reduction methods, consisting in reaction by lithium or sodium in liquid ammonia on an aryl diethyl phosphate, whereby yields around 75% are afforded of compounds in the benzene and naphthalene series. The recognition of the participation of "benzyne" intermediates in the reactions of aryl halides in the presence of strong bases is leading to the discovery of new reactions, among which is the direct phenylation of ketones, a process which has not hitherto proved feasible. 2:5-Dimethoxybenzoquinone now joins methoxy- and 2:6-dimethoxy-benzo-1:4-quinone as a natural product: it was isolated from the culture medium of *Polyporus fumosus*. *p*-Substituted monohydric phenols are oxidised by potassium nitrosodisulphonate (Fremy's salt) to *o*-benzoquinones. An elegant synthesis of azulene, which avoids the wasteful dehydrogenation step common to other methods, consists in condensing *cyclo*pentadiene with the glutacondialdehyde (prepared from 2:4-dinitrophenylpyridinium chloride and methylaniline), and heating the fulvene obtained *in vacuo* to give a 60% yield of azulene. Three years have elapsed since the last report on polysaccharides, so the greater part of the carbohydrates section is devoted to the subject, and an extended application of chromatographic methods is recorded for the determination of their detailed structures. The oxidation of starches by potassium metaperiodate has been studied in detail; and an accuracy of $\pm 0{\cdot}5$ glucose residue is claimed for unit-chainlength determinations; the repeating units of many starches have been determined by this method. A new attempt has been made to discover the ultimate origin of natural amino acids, and evidence has been presented that a wide variety of amino acids are formed when a mixture of methane, ammonia, hydrogen, and water is subjected to the combined action of a silent electrical discharge and a high-frequency spark. The present state of knowledge of the configuration of a number of proteins has been reviewed.

CRYSTALLOGRAPHY— This section is devoted to structural studies on proteins (including artificial and natural fibrous, and globular, proteins), nucleic acids, and viruses. In the prediction of protein structure, the idea of a hydrogen-bonded spiral first advanced by Huggins and refined by Pauling *et al.* has proved most fruitful; especially valuable has been Pauling's conception of a non-integral spiral allowing the greatest freedom for packing and hydrogen bonding. The value of these methods has been greatest in the field of fibrous substances, especially of synthetic fibres, which lack the complication of varied side-groups; the interplay between the study of corresponding synthetic and natural proteins has been most productive of results. The most spectacular advance of fibre analysis has been structure elucidation for the polynucleotides, and the results are likely to prove of considerable biochemical and even of genetic importance.

The usefulness of this Report to chemists of all kinds may be realised from the facts that there are thirty-four pages of names in three columns in the author index and eleven double-column pages of subject index, while references total 4,246, many of them composite, and are taken from 648 journals and other publications. It should be possible, therefore, to discover the relevant original papers on any particular topic.

H. H. HODGSON

Plastics Progress 1955

Papers and Discussions at the British Plastics Convention 1955

Edited by P. Morgan. Pp. viii + 432. London: Iliffe & Sons Ltd. 1956. Price, 50s. 0d,

This work records the proceedings of a lively Convention held at Olympia, London, in June 1955, and is the third issue of what has become a biennial publication. The programme of the 1955 Convention was extremely wide and varied, 20% of the proceedings being devoted to fundamental academic studies of polymer structure and properties, while the remaining 80% ranged over the technology of expanded plastics, thermoplastics, extrusion, injection moulding, foundry resins, glass-reinforced plastics, and over works study, productivity, and patent law. It must be said that the 20% of fundamental science compares unfavourably with the technological papers. It appears that the more academic contributors are much less willing to treat the Plastics Convention as a forum for the announcement of new knowledge, or even for balanced reviewing of *recent* progress, than are the industrial authors. The industrialists were prepared, moreover, to give detailed recipes, to reveal their "know-how", and to be drawn by skilful questioners in the discussions on their papers— in one case (p. 98) to the borders of the Official Secrets Act.

It is inevitable, considering the range of subjects and the number of authors, that the work as a whole should be rather uneven. At its worst, a writer can take over half a page to explain what a parabola is (pp. 153–154). At its best the book can treat us to a new process for achieving the long-desired consistency in glass-fibre-reinforced mouldings, in a paper illustrated by its author (Mr. J. Rees) with no less than twenty photographs. The only trick his questioners failed to elicit in the discussion was the method used for holding the glass fibres of chopped strand mat steady in the mould against the flow of resin, which, in this new process, enters by injection. Valiant efforts are made elsewhere in this book to get down to the *fundamentals* of shaping articles made from plastics, be it by foaming, extrusion, or moulding.

In several places the discussions reveal that this country is not in the forefront of development, e.g. in such fields as nylons and polytetrafluoroethylene dispersions, where the Continent and the United States are, respectively, far in advance. It seems to the reviewer that the lack of a Research Association for the Plastics Industry, deplored by one speaker, is a contributory factor, while the insufficiency of educational facilities and research journals in this field in Britain is notorious. In the circumstances, any vehicle for the dissemination of up-to-date knowledge on plastics technology is doubly to be welcomed, and despite the unevenness mentioned, the reviewer feels inclined to recommend *Plastics Progress 1955* to all those who have an interest in the future of the Plastics Industry.

M. GORDON

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University

Badische Anilin- und Soda-Fabrik AG.

HELIZARIN BRILLIANT YELLOW RR— This pigment gives bright reddish yellows when bonded to textile materials by either printing or pad–dyeing methods, the colourings obtained having very good fastness to light and wet treatments and good fastness to white spirit, trichloroethylene, and perchlorethylene. It is also dischargeable. Fastness figures for a pad–dyeing (8 g. per litre) on cotton include— Light 6–7, washing (at the boil) 4–5, chlorine "b" 5.

INDANTHREN COLLOISOL DYES— The range of 46 Indanthren dyes currently available are listed together with the strength relationships between each and the normal commercial quality.

Imperial Chemical Industries Ltd.

PROCION DYES— This circular describes three new dyes— Procion Yellow R, Procion Brilliant Red 2B, and Procion Blue 3G— belonging to a new class which the makers have designated "reactive", since fixation to the fibre is achieved by direct chemical linkage. Combination between dye and fibre is promoted by alkali and is rapid and irreversible. The three dyes of this type which have so far appeared are characterised by high solubility in water, low affinity for cellulosic fibres, and mutual compatibility, and are thus well suited for continuous application to cotton, linen, and viscose rayon by a padding technique. They have marked affinity for polyamide fibres, to which they may be applied in the same general

way as acid wool dyes to give bright dyeings having similar wet-fastness properties to those of dyeings of the fastest vat dyes.

They are of great interest for printing cellulosic materials, since bright colours of very good fastness to light and wet treatments can be obtained by direct printing using a sodium alginate thickening containing urea and sodium bicarbonate, which decomposes during steaming to provide the alkaline conditions necessary for fixation. The Procions may be printed alongside Alcian X dyes, Soledons, and Brentogens provided that the last-named are developed by neutral steaming. They are not recommended for printing alongside vat dyes or on Brentholprepared grounds. They are not recommended for white discharges nor for illuminated discharge styles. White resists and coloured vat resists can be obtained. Procions may also be printed on chlorinated wool and on silk, but are not recommended for secondary cellulose acetate or cellulose triacetate, nylon, Orlon, or Terylene.

The dyes themselves are anionic. In aqueous solution they are not stable indefinitely, but no significant deterioration occurs during 4 hr. at 50°C. Solutions should never be boiled, and contamination with strong alkali prior to development must be prevented. Fastness figures on cotton of a medium-depth pad–dyeing produced on the Standfast molten-metal machine include— *Yellow R:* Light 6, washing (Test No. 5, 5 times at 100°C.) 4–5; *Brilliant Red 2B:* Light 5–6, washing (Test No. 5) 3–4; *Blue 3G:* Light 6–7 (¼ standard depth), washing (Test No. 5) 4–5.

TECHNICAL INFORMATION LEAFLETS— *Dyehouse No. 288. Direct Dyes for the Viscose Rayon Carpet Trade*— This leaflet lists dyes of particular interest for dyeing viscose rayon staple fibre for needleloom and tufted carpets, and includes notes on the selection of dyes for application by pad–steaming and for dyeing undesulphurised viscose rayon, suitability for vulcanising, and methods of dyeing loose material, yarn, and woven carpeting. Combinations of dyes for typical carpet colours are given.

Dyehouse No. 291. Soledon Dyes: The Dyeing of Viscose Rayon Union Fabrics— Details are given of the degree of staining of secondary cellulose acetate, cellulose triacetate, Terylene, and Orlon when titanium-dioxide-delustred staple synthetic fibre was dyed in presence of bright viscose rayon staple for 1 hr. at 60°C. Since nylon has a high affinity for certain Soledon dyes, the behaviour of these dyes when applied to a 50 : 50 mixture of viscose rayon and nylon has been determined in presence and in absence of Lanoc CM as a restraining agent. The fastness to light of the coloration obtained on the nylon has also been determined. If a padding technique is used, solid dyeings are obtained provided that the nylon content does not exceed 20%.

Dyehouse No. 293. Vat Dyes on Acetate Rayon: Printing by the Thiourea Dioxide (Manofast) Method— This note indicates those Caledon and Durindone dyes suitable for application by this method and tabulates the fastness to light of pale and deep prints on both bright and delustred cellulose acetate. This is dependent on the final soaping treatment, which should be carried out above 75°C. for 10 min. to give maximum fastness.

Dyehouse No. 297. Alcian X Dyes: Recommendations for Processing "Heavily Covered" Patterns— A summary is given of methods of preventing unevenness in blotch patterns and avoiding the bleeding and staining during rinsing and soaping which have been found to occur during the processing of patterns showing relatively large areas of Alcian X dyes, particularly Blue 8GX used in full depths alone or in mixtures.

Dyehouse No. 305. Procion Dyes. Application to Cotton, Linen, and Viscose Rayon by Batchwise Dyeing Techniques— This leaflet describes batchwise methods for applying these new dyes based on laboratory and semi-bulk experiments which established that they could be so applied as well as by the continuous methods described in SC 787, *Procion Dyes.* The procedures described include application on the jig and by padding followed by development on the jig or winch, and are based on the substantivity of these dyes for cellulosic fibres in cold solutions in presence of electrolytes and their subsequent direct chemical linking to the fibre by adding alkali to the cold dye solution. The three dyes at present available show some difference in dyeing behaviour depending on the dye and electrolyte contents, the pH of the dyebath, and the nature of the substrate, and the concentrations of alkali recommended are a compromise which will give adequate colour value for all three dyes when applied in mixtures.

Dyehouse No. 308. The Application of Procion Dyes to Natural Silk— The reactive Procion dyes may be applied to silk either (*a*) from a cold dyebath containing salt and soda ash or (*b*) from a cold or hot dyebath in presence of enough weak acid to effect exhaustion. The dyeings obtained are much superior in fastness to those obtained with acid milling dyes and are equal to vat dyeings. The application of vat dyes to silk is a slow process and there is risk of alkali damage; with Procion dyes neither strong alkalis nor strong acids are required. Fastness figures for the three Procion dyes are given together with comparable figures for dyeings with Carbolan Blue B, Durindone Pink FF, and Caledon Yellow 5G. These dyes are also of interest on tin-weighted silk.

Dyehouse No. 313. Procion Dyes: Notes on their Application to Cellulosic Fibres by Textile Printing— Further experience has led to modification in the method of dissolving these dyes. Addition of a sequestering agent is essential when sodium alginate thickenings are used, otherwise a stiff, harsh handle is obtained. In presence of a sequestering agent water with up to 28° of hardness (Clark) (40 p.p.m. $CaCO_3$) has no effect either on the paste or on the final print. Maximum paste stability is obtained by storing in a refrigerator. Procion prints on cotton and viscose rayon are entirely unaffected by normal dry-cleaning solvents.

Dyehouse No. 314. Procion Dyes. Continuous Dyeing of Woven Cellulose Fabrics— Recent laboratory experiments have shown that, subject to certain limitations, the continuous or semi-continuous application of the Procion dyes may be simplified by adding an alkali-developing agent, e.g. sodium bicarbonate, to the padding liquor, thereby making possible a one-stage process by eliminating the alkaline aftertreatment hitherto recommended. Cold dye-padding liquors containing sufficient bicarbonate to promote dye fixation approximating to that obtained in the two-stage process are stable for up to 4 hr.

Dyehouse No. 320. Wax, Soap, and Water Fastness of Pigments in Printing Inks— Figures are given for the fastness to wax, soap, and water of a fully dried, full-depth print of the complete range of pigments dispersed in a thin lithographic varnish medium, the conditions of test having been modified to give information more closely related to actual works practice.

Dyehouse No. 321. Procion Dyes: Printing Application without Steaming— If material printed with Procion dyes and dried is then "nip-padded" on a padding mangle or "cover-printed" on a printing machine with 20 g. of either sodium carbonate or sodium bicarbonate per litre and immediately dried on drying cylinders, rapid fixation occurs and there is negligible bleeding either in the padding liquor or on the printed material. Increased rate of production and colour yields equal to or even higher than by steaming can be obtained, and the method permits the use of these dyes under conditions where acid is liberated, e.g. when using Alcian X dyes; in such instances, fixation by steaming leads to lower colour yield of Procion dye.

Dyehouse No. 324. Effect of Vulcanising on Nylon dyed with Acid Wool and Direct Cotton Dyes— Dyeings of recommended acid and direct dyes have been vulcanised by— (i) the "hot air" process, with and without *iso*-cyanate bonding, (ii) the "cold cure" process, and (iii) the "open steam cure" process, and figures are given for the effect of the treatment on the dyeing.

Dyehouse No. 325. The Use of Fading Lamps— With reference to the recommendation that, in order to simulate average daylight exposures made in the U.K., fading lamps should be operated at an effective humidity of 20%, it is noted that routine fading-lamp exposures carried out in the Dyehouse Department since 1948 have been made in lamps operating at an effective humidity of $< 10\%$ and that, unless there is a specific request to the contrary, these lamps and conditions will continue to be used for routine testing.

Dyehouse No. 326. Brentogen Dyes: Development of Prints on Cotton by Baking— Details are given for developing Brentogen prints on cotton by baking at 140°C. for 3 min. An organic base such as monoethanolamine or

Brentogen Developer H and a relatively large amount of urea are included in the paste. The most suitable thickening agent is sodium alginate.

Dyehouse No. 327. Alcian X Dyes: The Use of Urea as Hygroscopic Solvent in place of Colydote B (or BN)— Urea, in presence of lactic acid, has been found quite suitable as an alternative to Colydote B (or BN), the prints obtained with all members of the Alcian X range being technically very similar.

Dyehouse No. 328 (replaces No. 186). *The Dyeing of Terylene Staple Fibre Hand Knitting Yarns*— Such yarns when dyed in Hussong machines may lack bulk and be kinked and curled, the dyeing also being uneven. Recommendations for avoiding these faults are given based on experiments using a machine of 100 lb. capacity (wool). It is noted that deformation occurs mainly on the upflow and is promoted by overloading of the machine. For level dyeing efficient wetting-out is essential, and any trapped air must be removed. The appearance of deformed yarns may be restored by steaming for > 15 min. at atmospheric pressure.

Dyehouse No. 329. The Hiding Power of Pigments— Values for the hiding power and the contrast ratio of ranges of organic and chrome pigments have been determined and are offered as a guide to the selection of the most suitable pigment for particular conditions of application.

Dyehouse No. 330. Fastness to Steaming of Disperse Dyes printed on Secondary Acetate Rayon, 6,6-Nylon, and Terylene Polyester Fibre, using a Modified Test— Figures are given for the fastness to steaming of the full range of disperse dyes on secondary cellulose acetate and nylon and of selected disperse dyes on Terylene based on a modified test using steam at atmospheric pressure. It is claimed that the conditions employed resemble much more closely commercial practice, and the test itself requires no special equipment.

Dyehouse No. 331— *Fluolite C in the Laundry Trade*— General directions are given for the correct and economical use of this fluorescent brightening agent.

Dyehouse No. 333. Woolen and Worsted Color Card of America— *Spring and Summer 1957.*

Dyehouse No. 334. The Dyeing of Cellulose Triacetate Fibre. Supplement No. 3: Fastness of Disperse Dyes to Gas Fume Fading and the Use of Inhibitors— Disperse dyes susceptible to gas-fume fading on secondary cellulose acetate are also susceptible on cellulose triacetate; differences are of degree only and insufficient to be of practical significance. Although Duranol Inhibitor GF is more efficient than the N brand, the latter is preferred because of ease of application and "non-yellowing" properties. Fastness figures are given for untreated dyeings and dyeings treated with Duranol Inhibitor GF and N of the range of disperse dyes recommended for triacetate.

Resins No. 10. Cold-curing Urea–Formaldehyde Wood Lacquers.

Resins No. 11. Chromium Plate Lacquers.

Rubber No. 41. Nonox WSP as an Anti-oxidant for Neoprene.

Rubber No. 42. Nonox BL: Inhibition of Sulphur Bloom in Unvulcanised Stocks.

Durazol Blue R— This homogeneous direct dye gives bright blues on cellulosic fibres and is particularly recommended for dyeing viscose rayon subsequently to be crease-resisted, since such processing produces only a slight change in hue and has no significant effect on the light-fastness of the dyeings, which have very good fastness to washing. It has good building-up properties and forms a useful basis for navy blues in combination with Durazol Orange 2G. It should not be used in combination with Durazol Yellows G, GR, and 3R, since these accelerate fading of the blue on exposure to light, especially if the material is damp. It is suitable for printing wool and silk and also viscose rayon by the urea process. Fastness figures on viscose rayon include— Light 6–7, perspiration 4–5, washing (Test No. 2, once at 55°C.) 3.

Durazol Green 5B— This homogeneous direct dye gives bluish greens of good fastness to light on cellulosic fibres. It builds up well and is recommended alone and in mixtures for full greens on furnishings and pile fabrics. Fastness to wet treatments, particularly of dyeings on cotton, is improved by aftertreating with Fixanol PN. A marked decrease in fastness to light of dyeings on viscose rayon occurs when the material is crease-resisted. It is suitable for printing wool and silk and also viscose rayon by the urea process. Dyed grounds on cotton and viscose rayon are dischargeable to white with acid Formosul. Fastness figures on cotton include— Light 5–6, perspiration 2, washing (Test No. 1, once at 40°C.) 3.

Soloxan Black S— This is an oxidation dye marketed in powder form and of particular interest to the textile printer for producing intense blacks of excellent fastness to light and wet treatments on cellulosic fibres. Unlike aniline black, there is negligible risk of degradation of the material during oxidation, and the alkaline printing paste is much more stable than pastes containing Diphenyl Black Base and the organic acid which must be present when the latter is used. It may be printed alongside Alcian, Brentogen, Soledon, vat, and mordant dyes and resin-bonded pigments, and in certain instances its use confers notable advantages. It is also of interest for printing wool and silk, but on cellulose acetate the blacks obtained are less intense than those obtained with Diphenyl Black Base. It is not recommended for printing nylon and, like all products of this type, should not be used for greys owing to irregularity in development and the rapid reduction in light fastness with decreasing depth of colour. Development of the black is prevented by reducing agents, so resists are possible, but once formed on the fibre the colour cannot be discharged. Fastness figures on cotton include— Light 7–8, washing (Test No. 5, 5 times at 100°C.) 3, hypochlorite ("dry chemicking") 5.

Adhevia T and Adhevia AQ— These are products for improving the adhesion of tar, bitumen, etc. to stone surfaces and are based on cetyltrimethylammonium bromide.

The Use of Quintolan W for the Production of Water-repellent Effects on Leather (2nd Edition).

Synsize W— A stable, concentrated emulsion of wax with protein dispersion agents. It has good adhesion for nylon and regenerated cellulose rayons coupled with excellent lubricating properties.

The Disc Method for the Determination of the Melting Point of Solid Resins— A reprint of a paper by S. Diamond (*J. Oil & Col. Chem. Assocn.*, **39**, 472 (July 1956)).

The Control of Sodium Hydrosulphite in Vat Dye-baths— A reprint of a lecture by W. J. Marshall (J.S.D.C., **72**, 201 (May 1956)).

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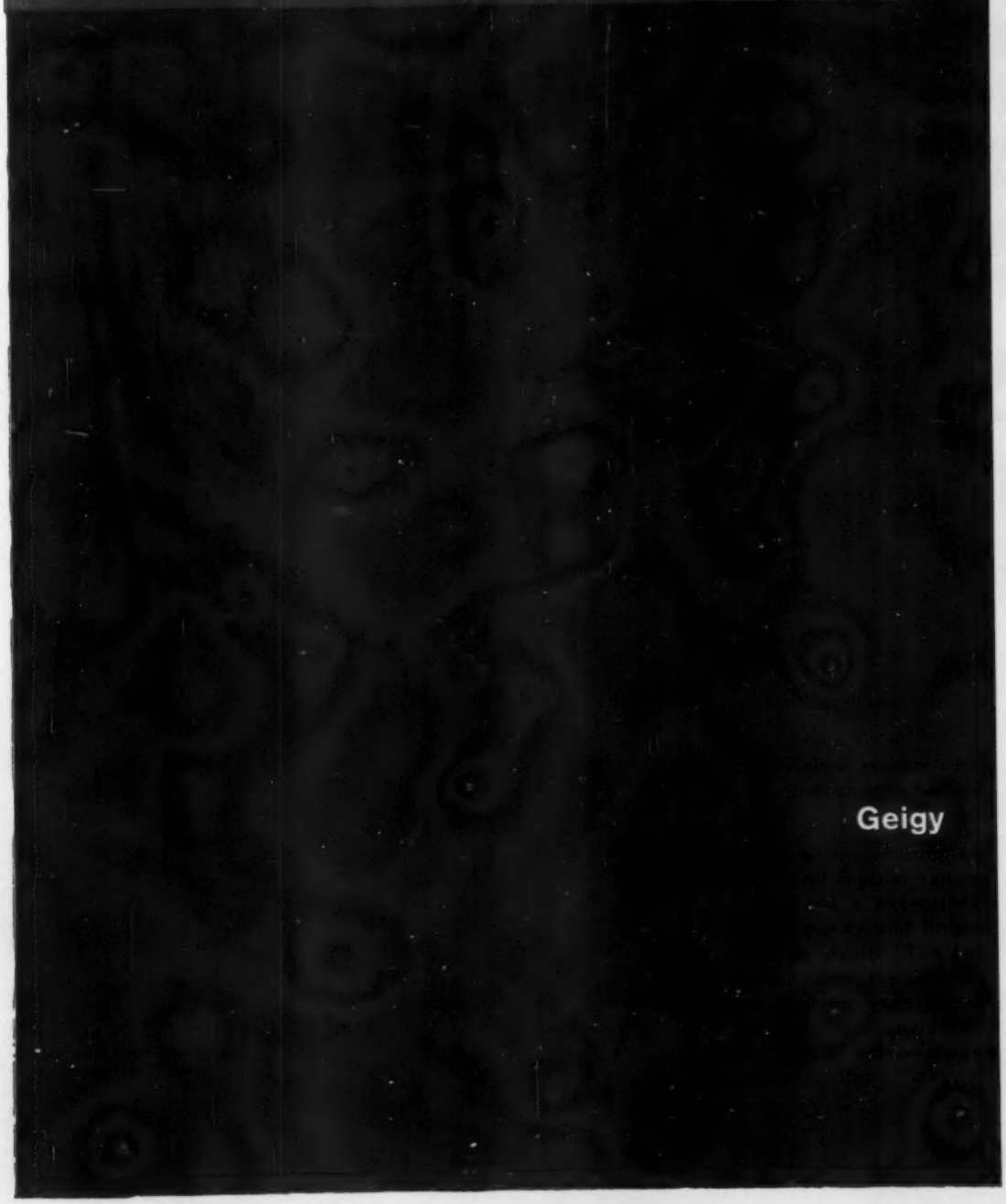

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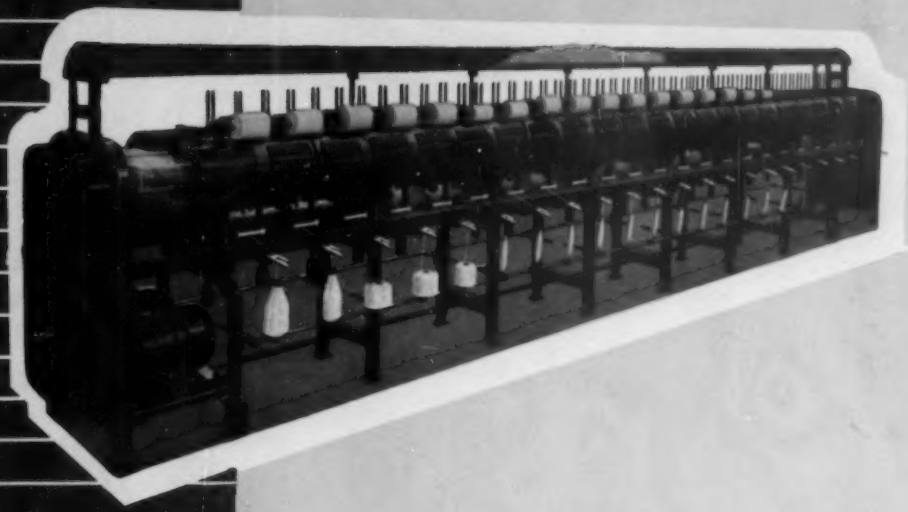

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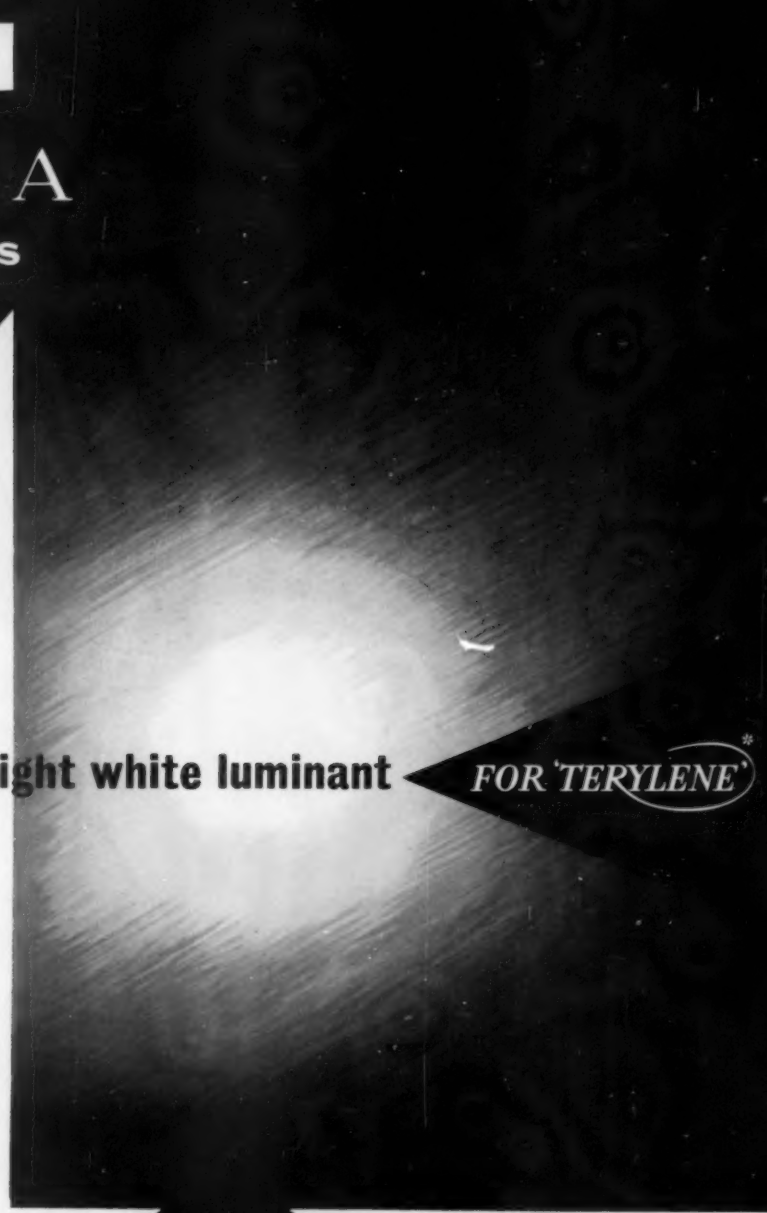

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Inns and the Textile Trade

No. 7. *'The Bridge on Wool,' Wadebridge, Cornwall.*

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Distressed by the accidents and drownings, a local vicar, Thomas Lovibond, devoted his energies to raising funds for a bridge.

Work on the bridge began. But the river bed, soft and sandy, swallowed up the slim, stone piers. After months of wasted effort, the dispirited Lovibond was about to abandon the venture when he had a dream.

An angel appeared with a flock of sheep and a pair of shears. As Lovibond clipped the sheep, their wool fell into the river in solid packs.

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A— (American) The methods of The American Association of Textile Chemists and Colorists.
B— (British) The methods of The Society of Dyers and Colourists.
C— (Continental) The methods of The Deutsche Echtheitskommission.

An important feature of PART I is the sub-division of each usage group into hue groups— Yellow, Orange, Red, Violet, Blue, Green, Brown and Black. The hue classification has been made by reference to a Hue Indication Chart which has been designed specially for the purpose. A copy of the chart is included with each set of volumes.

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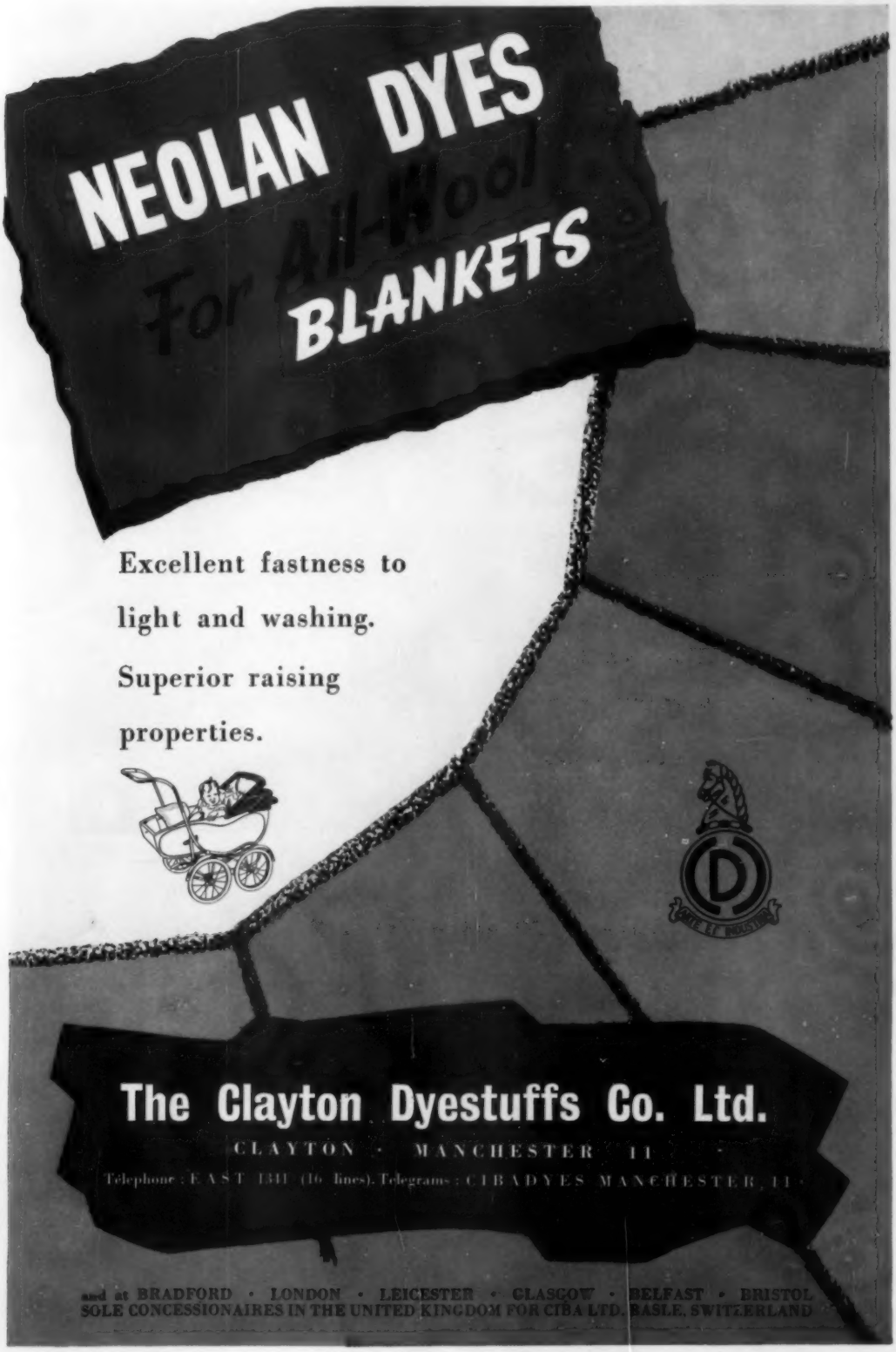
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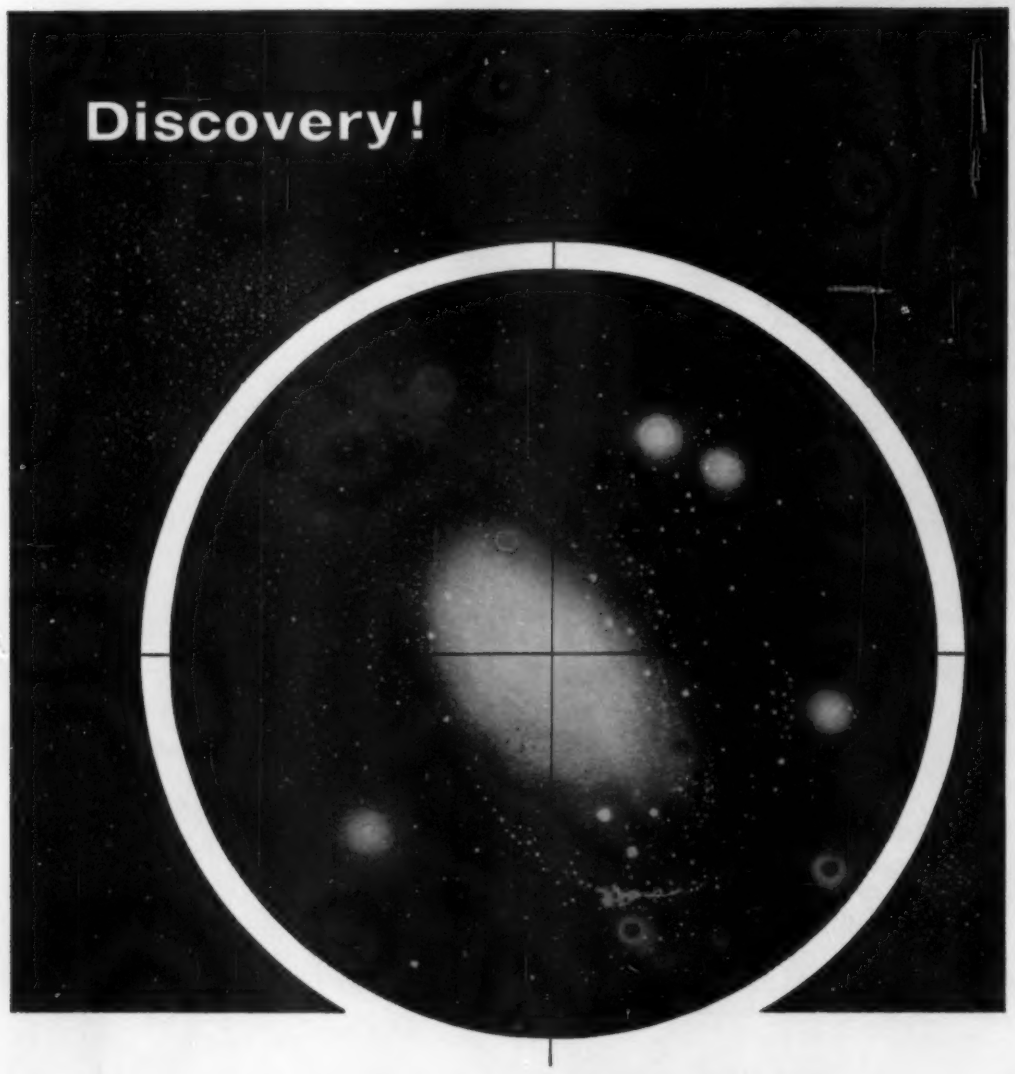

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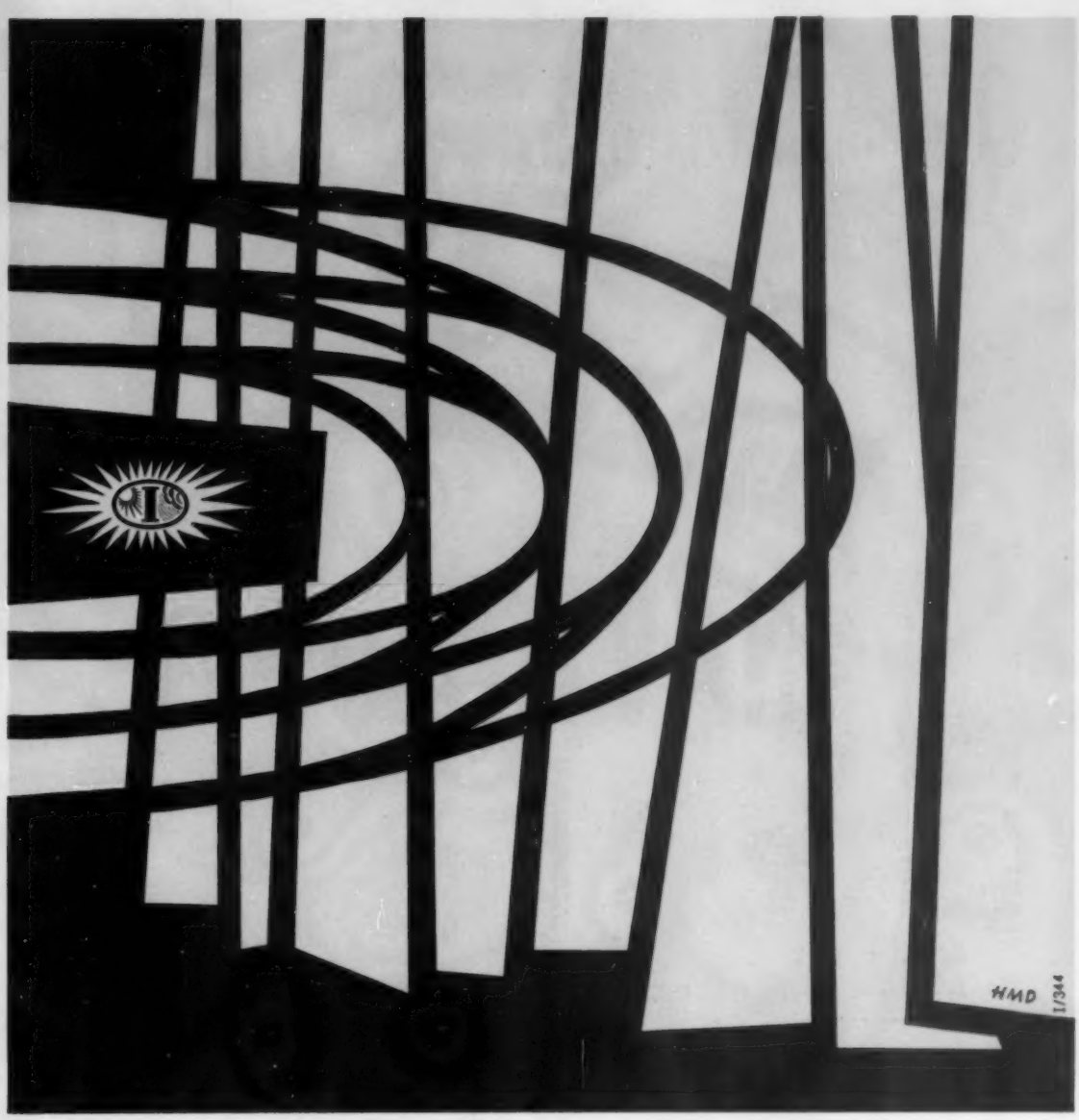

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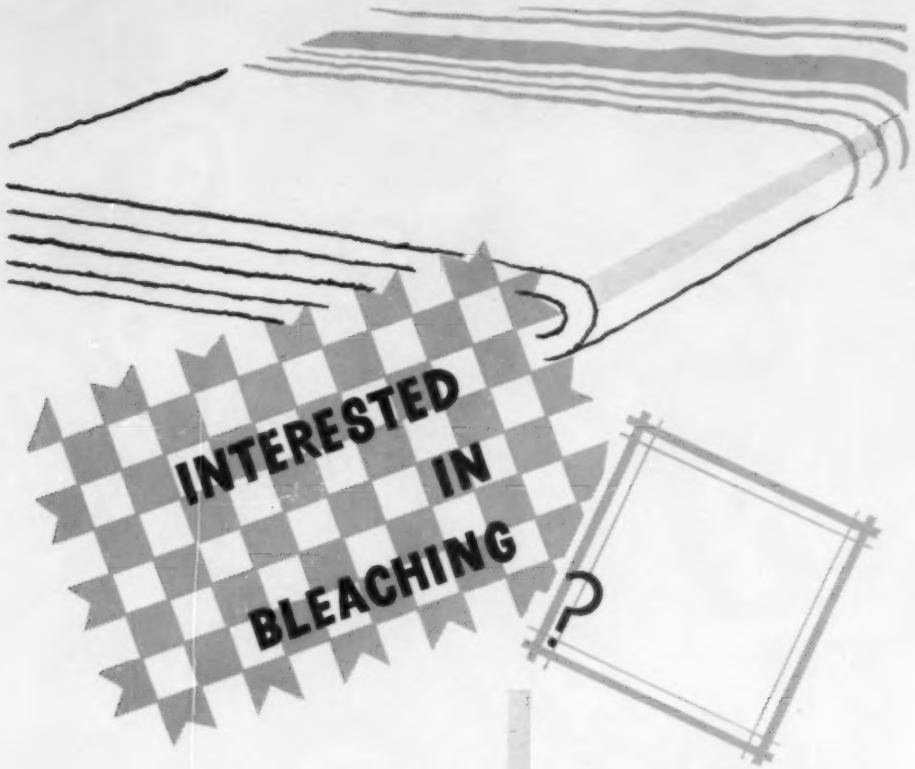

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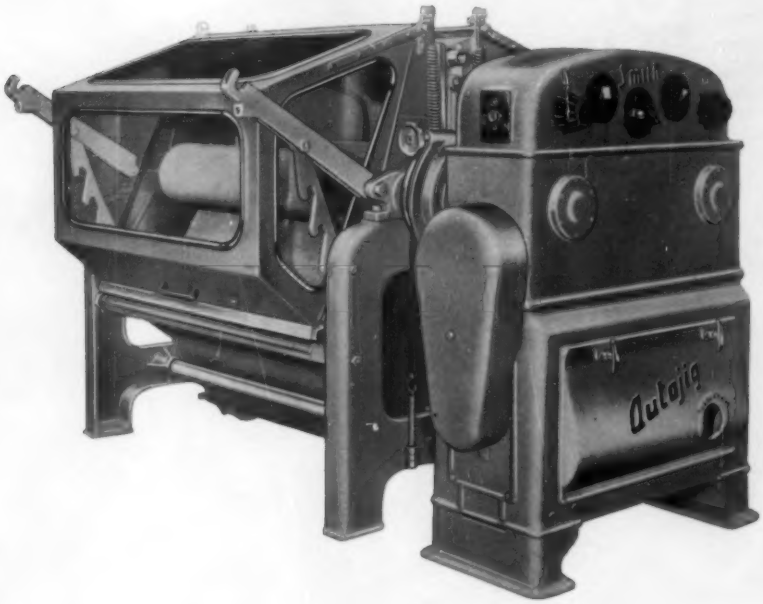

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Torque control enabling the Autojig to Start-up slowly, Slow-down gradually and STOP at the point of reversal, thereby preventing snatch — very essential when processing delicate fabrics.

A selector switch giving SIX different degrees of control can be set according to fabric being processed.

The Driving Unit can be fitted to ANY make of dyejig.

Automatic and non-automatic models can be supplied.

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Robust design. Maintenance reduced to a minimum ensuring trouble-free production.

No special electric motor — a standard squirrel cage motor provides the power unit.

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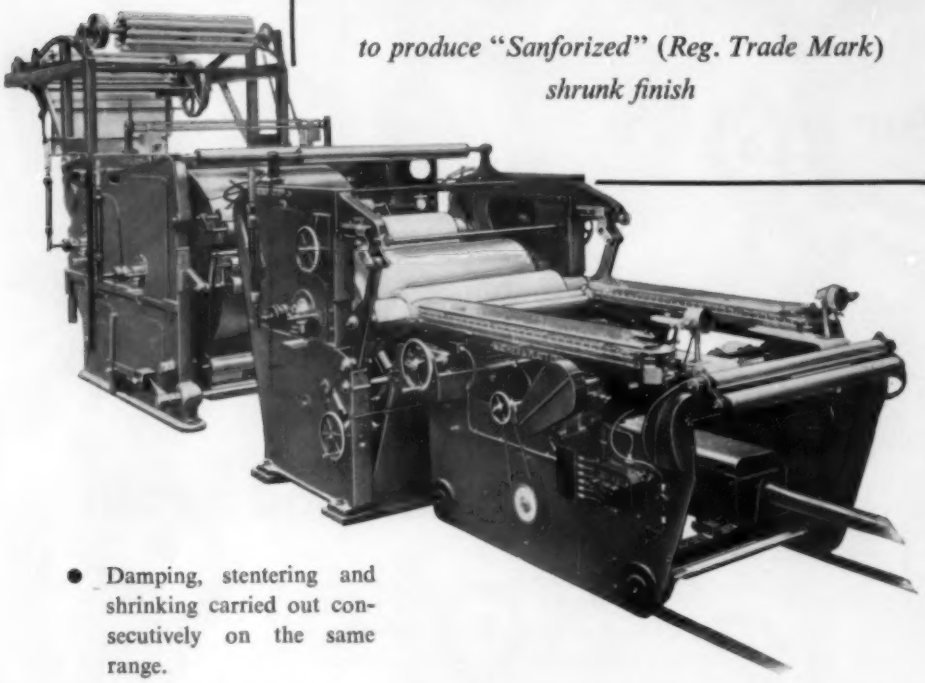

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- Automatic electric guider on clip expander.
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654

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., 68, *23 (Jan. 1952) and also, together with symbols and the periodicals abstracted, in the annual index*

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Generating Mechanical Vibrations of Liquids at High Frequency by Means of Rapid Pressure Fluctuations

Ultrasonics *BP* 758,589

Adding Liquid to a Viscous Spinning Solution

Algemene Kunstzijde Unie *BP* 756,590

A pre-determined proportion of a low-viscosity liquid is added continuously to a viscous spinning solution by suction into a pipe through which the spinning solution is pumped by means of two gear pumps in tandem, the point of entry being between the pumps and the capacity of the second being greater than the first. By this means the wear on the pumps when using a pigment suspension is reduced, and the accuracy of the metering is improved. W.G.C.

Spreading Liquid over Continuously Advancing Filaments

Kunstzijdespinnerij Nyma *BP* 758,204

Treating Filaments

Celanese Corpn. of America *BP* 756,480

Apparatus is described for subjecting a number of filaments to successive treatments in a continuous manner, e.g. in the saponification of cellulose acetate yarn to regenerated cellulose of high tenacity. W.G.C.

Countercurrent Treatment of Yarn with Liquids

American Viscose Corpn. *USP* 2,721,466

When treating yarn in successive batches in which the yarn travels against the flow of the liquor, the drag effect of the yarn causes the liquor immediately adjacent to the yarn to circulate in the direction the yarn is travelling. This drag effect can be eliminated and so more efficient treatment of the yarn obtained by placing a series of baffles in the bath. The baffles extend across the full width of the vessel and comprise two sets. One set is affixed to the bottom of the vessel. The other set extends downwards and is vertically aligned with the first set. The yarn is led between the top and bottom sets of baffles and the liquor also can only flow between the two sets of baffles, i.e. the baffles form a succession of chambers opening into each other only by the narrow passage between each pair of lower and upper baffles. C.O.C.

Piece-scouring Machine

M. Decloux *BP* 757,921

In a dolly or similar roller scouring machine, the fabric before passing between the squeeze rollers passes through a hollow cylinder to form it into a rope. This hollow cylinder is so made that the scouring liquor can be passed into it under pressure and then radially projected onto the fabric passing through the cylinder. This much reduces the number of times the fabric has to pass between the squeeze rollers and also reduces the amount of water needed for rinsing. C.O.C.

Continuous Wet Treatment of Fabric in Open Width

American Viscose Corpn. *USP* 2,721,465

The fabric is passed through the liquor contained in a tank, the path of the fabric being immediately above a flat plate extending across the width of the tank and nearly to its end. There are devices to circulate the liquor either with or against the direction of travel of the fabric. C.O.C.

Dyeing Machine

Obermaier & Cie. *BP* 757,431

A dyeing chamber and a dye-mixing and/or heating chamber in a common vessel are separated by a partition. A propulsion unit outside the vessel has its inlet connected to the dye-mixing chamber and its outlet to the dyeing chamber. The dye liquor flows over the top of the partition to re-enter the dye-mixing chamber. This gives uniform flow of the dye liquor through the material. C.O.C.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Literature Review on Oils and Fats, 1953

M. N. Krishnamurthi

Council Sci. Ind. Research, New Delhi, 1955, 42 pp.: *Chem. Abs.*, 50, 11687 (25 Aug. 1956)

Over 700 references. C.O.C.

Composition of Suint—Preliminary Communication

T. Green and R. Preston

J. Textile Inst., 47, T 497–T 498 (Sept. 1956)

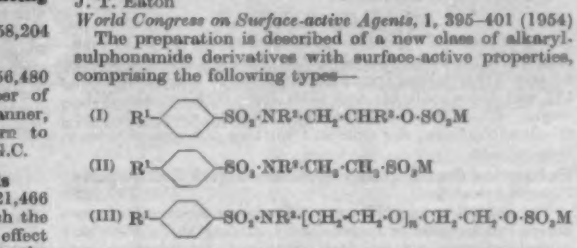
An aqueous extract at 50°c. from degreased Kent wool is analysed and a list is given of various acids—volatile, dicarboxylic, keto, and miscellaneous—that appear to be present. J.W.B.

Sulphated and Sulphonated Alkarylsulphonamide Surface-active Agents

J. T. Eaton

World Congress on Surface-active Agents, 1, 395–401 (1954)

The preparation is described of a new class of alkarylsulphonamide derivatives with surface-active properties, comprising the following types—



(I) R^1–C$_6$H$_4$–$SO_2 \cdot NR^2 \cdot CH_2 \cdot CHR^3 \cdot O \cdot SO_3M$

(II) R^1–C$_6$H$_4$–$SO_2 \cdot NR^2 \cdot CH_2 \cdot CH_2 \cdot SO_3M$

(III) R^1–C$_6$H$_4$–$SO_2 \cdot NR^2 \cdot [CH_2 \cdot CH_2 \cdot O]_n \cdot CH_2 \cdot CH_2 \cdot O \cdot SO_3M$

(R^1 = C_9–C_{15} Alk; R^2 = H, HO·CH_2·CH_2, or Alk; R^3 = H or CH_3; M = Na or K; n = 1–10). The results of laboratory wetting and detergency tests and commercial wool-scouring tests are quoted for various products of the above types. W.K.R.

Stability of Liquid Detergents at Low Temperatures

R. W. Noad

World Congress on Surface-active Agents, 1, 414–419 (1954)

Factors affecting the low-temperature stability of liquid detergents of the *sec.*-alkyl sulphate type containing sodium sulphate are discussed, particularly the relationship between the active-material clear-point and the inorganic-salt clear-point. The effectiveness of stabilisation by cation replacement, desalting, and solvent additions is considered. W.K.R.

Mechanism of Polymerisation of Ethylene Oxide on Phenol

O. Bobleter

Mh. Chem., 87, 483–490 (June 1956)

Detection of Free Radicals in Sodium Dithionite by Paramagnetic Resonance

W. G. Hodgson, A. Neaves, and C. A. Parker

Nature, 178, 489 (1 Sept. 1956)

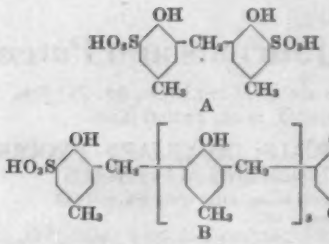
Anhydrous crystals of $Na_2S_2O_4$ *in vacuo* at liquid-air temp. show a weak paramagnetic resonance band with a g value of $2{\cdot}01 \pm 0{\cdot}01$ and width 12 ± 3 gauss, which is ascribed to a free radical. The free-radical content increases if the crystals are wetted with H_2O or C_2H_5OH, but disappears on complete dissolution in H_2O. The radicals are stable in the absence of air and correspond in amount to ca. 0·01% dissociation of $S_2O_4^{2-}$. It is thought that SO_2^- radicals are produced. A.J.

Constitution of Syntans

J. Strachota

Kožařství, 5, 132–136, 154–157 (1955): *Chem. Abs.*, 50, 11697 (25 Aug. 1956)

Fractionation of sulphonated Novolacs (I) and determination of free H_2SO_4 are described. The constitutions of IG. syntans given in *BIOS* reports are not always correct. In I a structure between A and B is assumed—



A

B

but the structure of the condensates of dihydroxybenzenes and their homologues with aldehydes is largely unknown. C.O.C.

Molecular Size of Phenol–Formaldehyde Resins used for the Production of Syntans, and Kinetics of their Formation
I. Binko and F. Hejcl

Kožařství, **5**, 174–177 (1955): *J. Amer. Leather Chem. Assocn.*, **51**, 505 (Sept. 1956)

PATENTS

Surface-active Alcohol Sulphates
Monsanto *BP* 757,937

Compounds of formula —

$$RO(C_2H_4O)_n\ C_2H_4OSO_3H$$

(R = mixture of primary branched-chain alkyl groups derived from tridecylalcohol, the mixture being derived by an OXO synthesis from triisobutylene or tetrapropylene, CO and H; n = 0–14) and their salts with metals, NH_4, mono-, di- or tri-alkylamines of < 9 C or mono-, di- and tri-alkanolamines, are excellent wetting out and penetrating agents. C.O.C.

Enhancing the Solubility of Anion-active Compounds
Böhme Fettchemie *BP* 757,987

The solubility in cold water of organic anionic surface-active compounds is increased by mixing them with an organic electro neutral salt obtained by treating an anionic surface-active compound containing an aliphatic radical of > 5 C and a sulphonic acid ester or sulphonic acid group with an organic cationic surface-active onium compound containing an aliphatic radical of > 3 C. Thus the solubility of alkyl sodium sulphate (Alk of 12–18 C) is increased by addition of a little dodecyl pyridinium chloride. C.O.C.

Stable Dispersions of Silicon Dioxide in Solutions of Cellulose Ethers — Sizes
Kunstzijdespinnerij Nyma *BP* 756,692

A stable dispersion suitable for sizing textile yarns is obtained by adding sodium silicate solution to the reaction mixture in the preparation of the cellulose ether, and neutralising with acetic acid.

Size for Terylene Warps
ICI *BP* 758,479

A mixture of a partially water-soluble NH_4, Na or K substituted alkylacrylate polymer, water and either urea, thiourea or a 2-hydroxyethylamine is a good size for Terylene warps. C.O.C.

Size for Coloured Cellulose Acetate Warps
Monsanto *BP* 757,754

An aqueous solution of an ammonium salt of a co-polymer of 95–99 mol. % of vinyl acetate and 5–1 mol. % of an ethylenically unsaturated aliphatic monocarboxylic acid of 3–8 C, e.g. crotonic acid, is applied and the warp dried at > 130° F. Loom-finished fabrics woven from warps sized in this way do not form "water-spots" when drops of water fall on them. C.O.C.

Water-soluble Polymers of Methacrylamide—Protective Colloids
BASF *BP* 757,770

The high molecular weight products obtained by copolymerising methacrylamide, if desired mixed with other carboxylic amides of 3–4 C, with ≤ 6% of *N*-vinyl pyrrolidone, are soluble in water throughout the entire pH range at room temperature. They are resistant to fungi and bacteria and are used as thickening agents, protective colloids, finishes and sizes for textiles, leather, etc. Emulsions and dispersions produced with their aid are stable, compatible with pigments, and spread and dry well. C.O.C.

Stabilising Solutions of Peroxygen Compounds
Pennsylvania Salt Manufacturing Co. *BP* 758,611

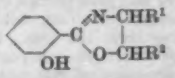
An aqueous solution of H_2O_2 is stabilised with a Mg salt and a Na or K tetra-, tripoly-, pyro-, hexameta or normal orthophosphate. There are 1–5 parts by wt. (on an anhydrous basis) of phosphate per part of Mg. C.O.C.

Accelerator for Use in Dyeing Animal Fibres
Cetesel *BP* 757,491

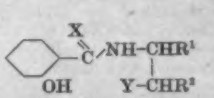
The material obtained by boiling animal fibres, e.g. waste wool, with an aqueous alkylsulphonic acid or dialkylsulphite, is treated with an alkyl borate. The resulting product when added to a dyebath containing acid, pre-metallised or mordant dyes reduces both the time and the temperature needed for dyeing and chroming. C.O.C.

Fungicides particularly suitable for Application to Paper Pulp
ICI *BP* 757,999

Compounds of formula —



(R^1 and R^2 = same or different H or Alk of < 5 C; the phenyl nucleus is substituted by at least one Hal and may also be substituted by more Hal and/or Alk of < 5 C), e.g. 2-(3′:5′-dichloro-2′-hydroxyphenyl)oxazoline, have good fungicidal properties. They can be prepared *in situ* by steeping the pulp in an aqueous solution of a compound of formula—



(where X = O, Y = Cl and where X = NH, Y = OH) and then gently heating it. C.O.C.

Rendering Copper 8-Quinolinolate Soluble
Geigy Chemical Corpn. *USP* 2,721,824

On heating copper 8-quinolinolate with a Zn, Co, Ni or Cu salt of an acid or hydrogen ester of a di- or tri-carboxylic acid a concentrated solution is obtained which may be diluted with volatile, liquid hydrocarbons. C.O.C.

Esters in Human-hair Fat (VI p. 607)

Carboxymethylcellulose. I— Viscosity–Molecular Weight Relationships in Various Solvents (XI p. 617)

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Food and Drug Law in the United States
C. W. Dunn

Chem. and Ind., 878–888 (1 Sept. 1956)

Modern Theories of Colour
M. J. S. Dewar

Chem. Soc. Spec. Pub., (4), 64–82 (1956)

A non-mathematical review, mainly of the author's work. H.E.N.

Constitution and Light Absorption. IX— Compounds with Cross-conjugated Chromophoric Systems
F. Bohlmann

Chem. Ber., **89**, 2191–2197 (Sept. 1956)

Such cpd. are prepared. Ultraviolet spectra demonstrate that, contrary to current ideas, considerable interaction occurs, but only when an almost coplanar configuration is possible. H.E.N.

Solvent Effects on Fluorescence Spectra and Dipole Moments of Excited Molecules
N. Mataga, Y. Kaifu, and M. Koizumi

Bull. Chem. Soc. Japan, **29**, 465–470 (June 1956)

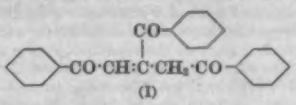
From consideration of long-range dipole interaction a general formula is developed covering the difference in shift between fluorescence and absorption spectra on changing the solvent. The observed shifts for some naphthalene derivatives in various solvents are in reasonable agreement. A.J.

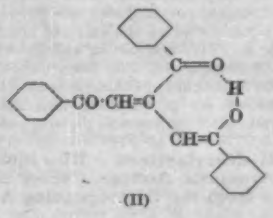
Upgrading of Extracts from the Refining of Lubricating Oils with Furfural. II— Use of Extract in Making Dyes
I. Matei, E. Cocea, C. Mărculescu, and G. Lupusor
Acad. rep. populare Romîne (Iasi). Studii cercetări ştiint, **5**, (1/2), 119–131 (1954): *Chem. Abs.*, **50**, 12456 (10 Sept. 1956)

Nitration of an extract from the furfural extraction of a lubricating oil gave a product containing C 55·15, H 4·71, N 6·91, O or NO_2 15·79, and O in the rest of the oxidised molecule 17·44%. It dyes wool yellow to maroon. Alkaline fusion with S gives dyes whose quality and yield depend on the extent of the nitration and oxidation of the extract and the amount of S used. These sulphur dyes give sandy browns to dark maroon dyeings, fast to washing, light, acids and alkalis on cotton and silk. C.O.C.

Reaction of α-Phenoxyacetophenone with Sodium— Kostanecki's Orange Compound
P. Yates, D. G. Farnum, and G. H. Stout
Chem. and Ind., 821–822 (11 Aug. 1956)

Kostanecki's orange compound (A) is produced in greater yield (48%) than hitherto by the action of sodamide on α-phenoxyacetophenone in the presence of catalytic amounts of methanol in ether soln. under N_2, and is shown to be $C_{24}H_{18}O_3$. Reduction of A with Zn and acetic acid gives 1:2:3-tribenzoylpropane and 2:5-diphenyl-3-phenacylfuran in low yields. The former is obtained in good yield using sodium thiosulphate in C_6H_5OH–H_2O and gives the latter on treating with hydrogen chloride in acetic acid. This leads to the suggestion that A is 1:2:3-tribenzoylpropene (I) or its isomer (II). These structures permit an interpretation of the changes in the spectra of A with changing media. The products of reaction of A with N_2H_4 also agree with these structural assignments.


(I)


(II)

A.J.

Structure of the Kostanecki Compound
P. F. Devitt, E. M. Philbin, and T. S. Wheeler
Chem. and Ind., 822–823 (11 Aug. 1956)

An independent determination, by similar methods, leading to the same structural formulae as described in the preceding abstract. A.J.

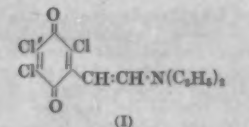
Light Absorption Studies
W. F. Forbes and W. A. Mueller

III— Structure and Light Absorption of Trisubstituted Benzene Derivatives
Canadian J. Chem., **34**, 1340–1346 (Sept. 1956)

IV— Effects of Sterically Hindered Conformations on the Electronic Spectra (B-Bands) of Conjugated Systems
Ibid., 1347–1355

Dehydrogenation of Tertiary Amines
D. Buckley and H. B. Henbest
Chem. and Ind., 1096 (13 Oct. 1956)

Triethylamine and chloranil react readily in benzene soln. to produce firstly tetrachloroquinol and vinyldiethylamine, which at once reacts with more chloranil to form the blue diethylaminovinylquinone (I) and triethylamine hydrochloride. This type of dehydrogenation reaction occurs generally when (*a*) the tertiary amine has at least one flexible alkyl group containing two carbon atoms, e.g. with *N*-ethyl- but not *N*-methyl-piperidine, and (*b*) the quinone is heavily halogenated.


(I)

A.J.

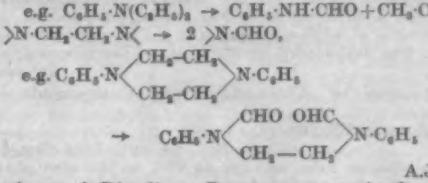
Oxidation of some Tertiary Amines with Manganese Dioxide
H. B. Henbest and A. Thomas
Chem. and Ind., 1097 (13 Oct. 1956)

Dialkylanilines in $CHCl_3$ soln. are oxidised by MnO_2 at room temp., oxidation of alkyl being the predominant reaction. Three different overall conversions can be recognised—

(*a*) $\rangle N{\cdot}CH_3 \rightarrow \rangle N{\cdot}CHO$,
e.g. $C_6H_5N(CH_3)_2 \rightarrow C_6H_5{\cdot}N(CH_3){\cdot}CHO$

(*b*) $-N(CH_2R)_2 \rightarrow -NH{\cdot}CHO$,
e.g. $C_6H_5{\cdot}N(C_2H_5)_2 \rightarrow C_6H_5{\cdot}NH{\cdot}CHO + CH_3{\cdot}CHO$

(*c*) $\rangle N{\cdot}CH_2{\cdot}CH_2{\cdot}N\langle \rightarrow 2\ \rangle N{\cdot}CHO$,



A.J.

Reactions of Disodium Pentacyanoamminoferrate with Aromatic Amines. I— Preparation and Properties of Compounds containing the Pentacyano-*p*-hydroxyanilinoferrate Ion
E. F. G. Herington
J.C.S., 2747–2752 (Aug. 1956)

$Na_2[Fe(CN)_5NH_3]$ reacts with *p*-aminophenol in alkaline soln. to give $Na_3[Fe(CN)_5{\cdot}NH{\cdot}C_6H_4{\cdot}OH]$, whose deep blue aq. soln. has an absorption max. at 695 mμ. with $\log_{10}\varepsilon = 4{\cdot}29$). This cpd. may find use as a spray reagent in paper chromatography, since it precipitates heavy-metal salts from dil. acid soln. as intensely coloured solids. H.H.H.

Molecular Polarisability. The Molar Kerr Constants of Benzyl Alcohol and Aniline at Infinite Dilution
M. Aroney and R. J. W. Le Fèvre
J.C.S., 2775–2778 (Aug. 1956)

Oxidation of Monohydric Phenols by Alkaline Ferricyanide
C. G. Haynes, A. H. Turner, and W. A. Waters
J.C.S., 2823–2831 (Aug. 1956)

Aromatic and Heterocyclic *o*-Dialdehydes. III— Synthesis of Benzene-1:2:4:5-tetra-aldehyde
W. Ried and H. Bodem
Chem. Ber., **89**, 2328–2331 (Oct. 1956)

Durene is converted into tetrakisbromomethylbenzene in 25% yield by means of *N*-bromosuccinimide. The bis-selenious ester of the tetrakishydroxymethyl cpd. obtained on hydrolysis decomposes on heating to give a very small yield of the desired aldehyde. H.E.N.

4-Hydroxy*iso*phthalic Acid
S. E. Hunt, J. I. Jones, and A. S. Lindsey
J.C.S., 3099–3107 (Aug. 1956)

Some aspects of the chemistry of the title substance, a by-product (3–5%) of the carboxylation of phenol by the Kolbe–Schmitt reaction in the commercial synthesis of salicylic acid, are explored. The acetylated deriv., in some of its reactions, behaves as a mixed anhydride. H.H.H.

Preparation and Properties of Deuterated Naphthalene Derivatives
E. J. Koller and H. Zollinger
Helv. Chim. Acta, **39**, 1610–1620 (Oct. 1956)

Sulphonation of Aromatic Compounds. II— Sulphonation of β-Naphthylamine
H. Iida and M. Ohkawa
Rept. Govt. Chem. Ind. Research Inst. Tokyo, **51**, 305–312 (Aug. 1956)

The mono- and di-sulphonation of β-naphthylamine has been studied under various conditions, the isomeric reaction products being determined by infrared spectrometric analysis— (1) By monosulphonation of β-naphthylamine below 80°c. only 2-naphthylamine-8-sulphonic

acid (60%) and 2-naphthylamine-5-sulphonic acid (40%) were obtained as reaction products, no other isomers being found. The ratio of the amounts of the two monosulphonic acids was almost independent of the time of reaction, but depended slightly on the temperature. The yield of the 8-sulphonic acid tended to increase with decreasing temperature, but the difference between the yield at 80°c. and the yield at 30°c. was only 4%. (2) When the reaction temperature was raised to above 100°c., 2-naphthylamine-6-sulphonic acid and 2-naphthylamine-7-sulphonic acid were found as by-products, and their quantities increased with increasing temperature and prolonged reaction. It was confirmed that they were produced by the rearrangement of the 8- and 5-sulphonic acids, which (3) were converted directly into each other. Under severe conditions the 5-sulphonic acid was more stable than the 8-sulphonic acid. (4) The reaction products of the disulphonation of β-naphthylamine were 2-naphthylamine-5:7-disulphonic acid (40%) and 2-naphthylamine-6:8-disulphonic acid (60%). The ratio of the amounts of the two disulphonic acids was almost independent of the conditions of disulphonation, and it was supposed that the ratio was determined by the stage of the monosulphonation. AUTHORS

Reduction of Aromatic Nitro Compounds with Silicon
R. Meier and F. Böhler
Chem. Ber., 89, 2301–2305 (Oct. 1956)

In alkaline soln., azo (up to 93% in the case of nitrobenzene), azoxy, and hydrazo compounds are formed, though amines are obtained in considerable amounts in the case of *o*-nitrophenol (53%) and *o*-nitrobenzoic acid (27·5%). *o*-Nitroanisole gave 63% of the azoxy cpd. with 5 Si, but 94% hydrazo deriv. with 10 Si. H.E.N.

Reduction of Nitrobenzene and its Derivatives. VI—Reactivity of Ferrosilicon as Reducing Agent
H. Iida
Rept. Govt. Chem. Ind. Research Inst. Tokyo, 51, 313–319 (Aug. 1956)

Practical details of the use of ferrosilicon containing 15% Si as a reducing agent have been investigated. C.J.W.H.

Infrared Spectra and Structure of some Quinone Monoximes
D. Hadži
J.C.S., 2725–2731 (Aug. 1956)

The infrared spectra of the monoximes of *p*-benzoquinone and 1:4- and 1:2-naphthaquinone (both isomers), as well as of their deuterium-substitution products, show that the oxime formulation correctly represents the structure of these cpd. in the solid state, and that this structure predominates also in their chloroform soln. However, 1:2-naphthaquinone 2-oxime seems to exist in the (chelated) nitroso form in soln. in carbon tetrachloride. Probable assignments are made of the C=O, C=N, and N–O stretching bands, and of the OH deformation band. The O–H stretching frequencies are discussed in connection with hydrogen bonding. H.H.H.

Janovsky Reaction
M. J. Newlands and F. Wild
J.C.S., 3686 (Sept. 1956)

Development of colour in the reaction between NaOH and an acetone soln. of *m*-dinitrobenzene or of 3:5-dinitrobenzoic acid is found not to be restricted to *m*-dinitrobenzene deriv. as had formerly been supposed. Colours and wavelengths of maximum absorption are given for fourteen aromatic dinitro compounds. H.H.H.

Complexes of Aromatic Nitro Compounds
A. Bier
Rec. Trav. chim., 75, 866–870 (June 1956)

Thermodynamic data and absorption maxima are recorded for a number of complexes of *s*-trinitrobenzene with aromatic amines and hydrocarbons. C.J.W.H.

Catalytic Hydrogenation of *m*-Nitroacylbenzenes to *m*-Alkylanilines
H. Oelschläger
Chem. Ber., 89, 2025–2029 (Sept. 1956)

Alkyl aryl ketones are nitrated with mixed acid at −20°c. and reduced in 78–95% yield by adding them dropwise in acetic-acid soln. at 40–70°c. to a suspension of Pd black in acetic acid–H_2SO_4 monohydrate saturated with hydrogen. The amount of monohydrate should be 1·1 mol. with respect to the nitro cpd. H.E.N.

***m*-Nitrocumene**
H. Hock and H. Kropf
Chem. Ber., 89, 2436–2438 (Oct. 1956)

p-Acetocumidide in acetic acid–acetic anhydride can be nitrated at 10°c. with nitric acid (sp.gr. 1·51), the presence of 1% sodium nitrite increasing the yield from 30 to 70%. On oxidation with chromic acid, 3:4-dinitrophenol is obtained. Hydrolysis yields *m*-nitro-*p*-cumidine, which is converted by diazotisation and treatment with cuprous oxide to *m*-nitrocumene in about 40% yield overall from *p*-nitrocumene. H.E.N.

Studies on the Intramolecular Hydrogen Bond in Conjugated Systems by the Measurement of Dipole Moments. I—*o*-Nitrophenol
B. Eda and K. Ito
Bull. Chem. Soc. Japan, 29, 524–527 (June 1956)

The dipole moments of anisole and some 2- and 4-substituted derivatives, calculated by vector addition of the dipole moments of the appropriate groups, are in good agreement with the observed values. With *o*-nitrophenol and its 4-substituted derivatives, significant discrepancies are obtained (0·4 D.), which are attributed to intramolecular hydrogen bonding. A.J.

Reduction of Nitrobenzene to Azoxybenzene by Sodium Borohydride
C. E. Weill and G. S. Panson
J. Org. Chem., 21, 803 (July 1956)

Oxidation of Hydrazobenzene by Ammonium Persulphate in Acetonitrile–Water Solution
B. J. P. Whalley, H. G. V. Evans, and C. A. Winkler
Canadian J. Chem., 34, 1154–1162 (Sept. 1956)

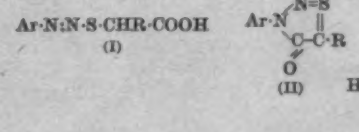
The rate of reaction between hydrazobenzene and persulphate was measured by determining the rate of formation of azobenzene with a Fisher electrophotometer. In a given experiment, second-order kinetics were displayed during the greater part of the reaction over a considerable range of initial concn. of reactants. The calc. second-order rate const. *k* decreased with increase in initial hydrazobenzene concn. and increased with increase in initial concn. of ammonium persulphate; its value was proportional to the square root of the ratio of the initial concn. of the reactants. The activation energy of the overall reaction was 16 kcal./mole. The data indicate a reaction initiated by the formation of sulphate ion radicals resulting from direct attack by persulphate ions rather than by sulphate ion radicals from unimol. decomp. of persulphate. H.H.H.

Aliphatic Hydroxylamines. III—Reaction with Diazotised Aromatic Amines. Novel Synthesis of Acylbenzenes from the Corresponding Amines
M. A. T. Rogers
J.C.S., 2784–2789 (Aug. 1956)

The behaviour of *NN*-dialkylhydroxylamines on autoxidation led to the prediction (cf. *ibid.*, 1093 (1956)) that they would condense with diazotised aromatic amines, but only in strongly alkaline media. In agreement with prediction, the products include dialkylamines and alkyl aryl ketones. In the special case of dimethylhydroxylamine, diaryl ketones are formed in addition to dimethylarylamines and aromatic aldehydes. H.H.H.

Anhydro Compounds from Nitrogen-containing Derivatives of Thioglycollic (Mercaptoacetic) Acid. III—Arylazo Compounds
G. F. Duffin and J. D. Kendall
J.C.S., 3189–3199 (Aug. 1956)

Arylazothioalkanoic acids (I) react with acid anhydrides in the presence of a tertiary base to give monomeric anhydro cpd., which may be regarded as 3-aryl-4-oxo-1-thia(S^{IV})-2:3-diazolines (II). Unlike the open-chain acids (I), the anhydro cpd. are very stable, weakly basic substances which undergo the characteristic reactions of aromatic systems with electrophilic reagents. The reactions of the anhydro cpd. from *p*-tolylazothioglycollic acid (I: Ar = *p*-C_6H_4·CH_3; R = H) are described in detail.



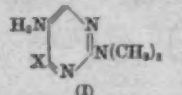
H.H.H.

Relation of Chemical Constitution to Colour in the Monoazo Acetoacetarylides
W. F. Whitmore and S. Zuckerman
Amer. Ink Maker, **34**, (1), 28–35 (1956): *Chem. Abs.*, **50**, 10531 (10 Aug. 1956)

Two series of monoazo acetoacetarylides were prepared. Each compound was purified and its spectrophotometric curve made. In one series, the arylazoacetoacetarylides, the substituent was placed on the aromatic ring of the diazonium component and the coupling component kept constant. In the other series, 2-nitro-4-methylbenzenediazonium chloride was coupled to the acetoacetarylides with the substituent in the arylide ring. The substituents were (1) H, 1-naphthyl, and 2-naphthyl attached to azo in the first series, and to CO·N– in the second series; (2) the following in each of the 2, 3, and 4 positions: CH_3, Cl, OC_2H_5, NO_2 (3 and 4 only in the second series); and (3) in each of the 2 and 4 positions: OCH_3 and C_2H_5. The absorption spectra of the resulting yellow dyes in 5×10^{-4} M. soln. in chloroform were determined. The logarithm of the optical density was plotted against wavelength for 43 compounds. C.O.C.

Preparation of 4-Substituted 2-Dimethylamino-5-nitro- and -5-aminopyrimidines
D. G. Saunders
J.C.S., 3232–3234 (Aug. 1956)

The preparations of the title substances (I: X = OH, O·CH_3, and NH_2) are described. All the 5-amino-2-dimethylaminopyrimidines are weak colour-developers.



(I) H.H.H.

Kinetics and Mechanism of Diazotisation. X—Aniline and Chloroanilines in Hydrochloric Acid Solution
H. Schmid and E. Hallaba
Mh. Chem., **87**, 560–573 (Aug. 1956)

The velocity coefficients of the chloride-catalysed diazotisation of aniline and its *o*-, *m*-, and *p*-deriv. are determined at 0, 10, 15, and 25°C. It is shown that the rate-determining step is the nitrosation of the unionised amine with nitrosyl chloride. The logarithm of the velocity coefficient of the nitrosation is proportional to the logarithm of the basicity constant of the amine. H.E.N.

Course of the Colour Coupling Reaction of *p*-Aminodimethylaniline
J. Eggers and H. Frieser
Z. Electrochem., **60**, 372–376 (1956): *Chem. Abs.*, **50**, 11785 (10 Sept. 1956)

The kinetics of the coupling of Wurster's Red (I) in presence of p-$(CH_3)_2N \cdot C_6H_4 \cdot NH_2$ (II) with 2-hydroxy-3:5-dichlorodiphenyl (III) and with 5-chloro-2-hydroxytoluene (IV) was determined as a function of the initial concentration of I and II. The functional relations can be interpreted in terms of a rapid equilibrium between I and a mixture of II and the corresponding quinonediimine (V), followed by coupling of V with III or IV. C.O.C.

Coupling Reaction. XII—Salt Effects: Influence of Ionic Strength on Coupling to Phenols and Technological Application of the Addition of Salt
H. Zollinger
Helv. Chim. Acta, **39**, 1600–1610 (Oct. 1956)

The reaction rates of five coupling reactions of substituted diazobenzenes with 2:6- and 1:4-naphtholsulphonic acids are measured at ionic strengths of 0·005–0·25. The reactions with diazotised *p*-toluidine and *o*-anisidine exhibit a negative salt effect, those with aniline-2:5-disulphonic acid a positive one, and the rate of the substitution proper in coupling reactions with sulphanilic acid is only slightly influenced by ionic strength. The measured salt effects correspond qualitatively to Brönsted's equation. In the buffer range of the naphthol–naphtholate equilibrium the secondary salt effect has to be taken into account, but this was neglected by Conant and Peterson. In certain technical coupling reactions, the yield of azo dye is increased by adding NaCl beforehand. In the case of the reaction orthanilic acid→2-naphthylamine-6-sulphonic acid, this phenomenon is demonstrated to be due to the relative insensitivity of the coupling to ionic strength, whereas the rate of decomposition of the diazo cpd. is reduced considerably. H.E.N.

Reactions with ^{15}N. XXIII—Mechanism of Formation of Aryl Azides by the Diazo Reaction
K. Clusius and M. Vecchi
Helv. Chim. Acta, **39**, 1460–1483 (Oct. 1956)

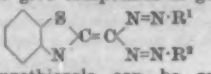
Even in the case of diazotised 2:4-dinitroaniline, where replacement of the diazo group by the azide ion would be favoured greatly, such replacement does not occur. In the case of diazobenzene, it had previously been shown (cf. J.S.D.C., **70**, 306 (1954)) that the reaction takes the following course—

$$[\underset{a\ b}{C_6H_5 \cdot N{:}N{:}N}]^+ + [\underset{c\ d\ e}{N{:}N{:}N}]^- \rightleftharpoons \begin{cases} \underset{a\ b\ c}{C_6H_5 \cdot N{:}N{:}N} + \underset{d\ e}{N{:}N} & 85\% \text{ (i)} \\ \underset{a\ c\ d}{C_6H_5 \cdot N{:}N{:}N} + \underset{b\ e}{N{:}N} & 15\% \text{ (ii)} \end{cases}$$

In a series of nine nuclear-substituted aryldiazonium salts tagged with ^{15}N in position (*b*), it is now found, as expected, that the course of the reaction is greatly influenced by the electronic character of the substituent. Nucleophilic substituents decrease the importance of reaction (i) (e.g. *p*-ethoxy to 73%), electrophilic substituents increase it (e.g. 2:4-dinitro to 100%). Reaction (i) goes mainly via a linear pentazen, (ii) via a cyclic one, and the latter is therefore hindered by *ortho* substituents. The studies were carried out in hydrochloric acid solution, as sulphate ions complicate results through exchange reactions. H.E.N.

Azo Dyes formed by Coupling with Reactive Methyl Groups
H. Wahl, M.-T. le Bris, F. Gault, and F. Pierrot
Teintex, **21**, 697–713 (Sept.), 786–797 (Oct. 1956)

2-Methylbenzothiazole can be coupled in two stages with diazonium salts, using the same or different components for each stage, to give compounds of general formula—



The 2-methylbenzothiazole can be replaced in the reaction by its substituted derivatives, by 2-methylbenzoselenazole, by 2:3-dimethylbenziminazole, and by 2-methylbenzoxazole. Using diazonium salts giving OH or COOH *ortho* to the azo link leads to lake-forming dyes. The products are capable of practical application, being insoluble in the absence of solubilising groups. Also, coupling does not occur if the pH is sufficiently low, so that the components may be printed or impregnated in aqueous acid solutions and subsequently developed in ammonia vapour. S.R.C.

Some Aspects of *cis–trans* Isomerism in Azo Dyes
E. Atherton and R. H. Peters
Chem. Soc. Spec. Publ. (4), 17–27 (1956)

The rates and energies of activation for *cis–trans* dark reactions of a series of phenylazo-1-naphthylamines are determined. Substituents *ortho* to the azo group hinder the rate of recovery of dyes irradiated in a film of cellulose acetate. It is shown, by dyeing cellulose both in the dark and under illumination, that irradiation of Chrysophenine G (I) in aqueous soln. causes *trans–cis* isomerisation of the azo groups. The *cis* form has less affinity and dyes more slowly than the *trans*. Further work indicates that the *cis* form probably possesses zero affinity. It does not exhibit phototropism when dyed on Cellophane, probably because it is too firmly attached, but azo dyes dyed on cellulose acetate are phototropic. Chlorazol Sky Blue FF is unaffected by irradiation, and its complex with I undergoes only those changes to be expected from the isomerisation of I and the consequent break-up of the complexes concerned. H.E.N.

Steric Effects in Azo and Indigoid Dyes
W. R. Brode
Chem. Soc. Spec. Publ. (4), 1–16 (1956)

A review covering optically active dyes, *cis–trans* isomerism in azo and indigoid dyes, association effects, and related topics. H.E.N.

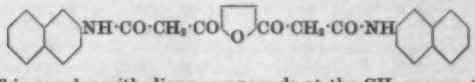
***p*-Ethoxychrysoidine as Acid–Base Indicator and Oxidation–Reduction Indicator**
E. Pungor and E. Schulek
Z. anal. Chem., **150**, 161–166 (1956): *Chem. Abs.*, **50**, 10595 (10 Aug. 1956)

The colour change occurs at pH 3·5–5·5. This change is

explained on the basis of quinoidal regrouping and also by resonance theory. The behaviour of *p*-ethoxychrysoidine as an oxidation–reduction indicator is ascribed to the reversible change of ·N:N· to ·N(→O):N· with an e.m.f. of 0·76 v. C.O.C.

New (Disazo) Furan Dyes
G. Modena and R. Passerini
Boll. sci. Fac. Chim. ind. Bologna, **13**, 72–75 (1955): *Chem. Abs.*, **50**, 10074 (25 July 1956)

Methyl 2-furoate on acetylation gives methyl 5-acetyl-2-furoate, which on oxidation with hypochlorite gives furan-2:5-dicarboxylic acid. Treatment with PCl_5 then gives the bis(acid chloride), which is condensed with *N*-acetoacetyl-*β*-naphthylamine in alcohol with Na to give



This couples with diazo compounds at the CH_2 groups to give yellow to orange and brown disazo compounds; e.g. diazobenzene gives a yellow. E.S.

Azo Dyes from 8-Amino-1-aza-anthraquinone
M. Yokote and T. Kamata
J. Chem. Soc. Japan, Ind. Chem. Sect., **58**, 574–576 (1955): *Chem. Abs.*, **50**, 10411 (25 July 1956)

8-Amino-1-aza-anthraquinone dissolved in conen. H_2SO_4 and then mixed under cooling with sodium nitrite and 25% aq. NaOH gave the diazo compound, which coupled with *β*-naphthol and Naphtol AS to give azo compounds which dyed cellulose acetate orange–red and red–violet respectively. E.S.

Formazyl Complex derived from Thiophen
M. Seyhan and C. W. Fernelius
Chem. Ber., **89**, 2482–2483 (Oct. 1956)

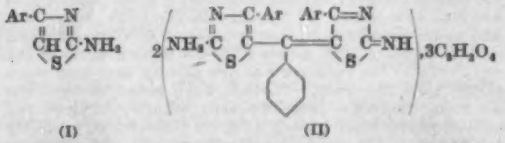
The formazan from diazotised anthranilic acid and the phenylhydrazone of thiophen-2-aldehyde forms a dark green complex with nickel and a deep violet one with copper. H.E.N.

Centenary of the Discovery of Fuchsine
B. M. Bogoslovskiĭ
Tekstil. prom., **16**, 39–40 (July 1956)

The discovery of fuchsine by the Polish chemist J. Natanson in 1856 and other early work on this dye are discussed briefly. A.E.S.

Preparation of Thiazole Dyes of the Doebner Violet Type
B. Das
J. Indian Chem. Soc., **33**, 385–388 (June 1956)

4-Aryl-2-aminothiazoles (I) (aryl = *p*-tolyl, *p*-chlorophenyl, *p*-methoxy- and *p*-ethoxy-phenyl, and 1-naphthyl) gave with benzaldehyde in the presence of HCl di-(4-aryl-2-aminothiazole-5-yl)-phenylmethanes. Oxidation of these with lead dioxide to the corresponding carbinol and treatment with oxalic acid gave the green basic dyes (II).



(I) (II)

C.H.R.

Light Absorption of Methyl- and Methoxy-acridones
H. Brockmann, H. Muxfeldt, and G. Haese
Chem. Ber., **89**, 2174–2190 (Sept. 1956)

7-Methylquinoline-2-aldehyde
M. Seyhan and W. C. Fernelius
Chem. Ber., **89**, 2212–2213 (Sept. 1956)

Prepared in 32% yield by SeO_2 oxidation of 2:7-dimethylquinoline. H.E.N.

New Synthesis of 2:4-Dihydroxyquinoline (4-Hydroxycarbostyril)
E. Ziegler and H. Junek
Mh. Chem., **87**, 503–508 (Aug. 1956)

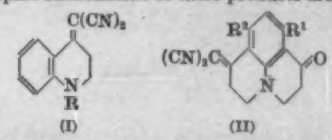
The dianilide of malonic acid is heated with $AlCl_3$ at 305°c. for 10 min. to yield 79% of 4-anilino-2-hydroxyquinoline. With HCl under pressure 2:4-dihydroxyquinoline is produced smoothly. H.E.N.

2:6-Dimethyl-4-alkoxypyronium Cyanine Dyes
A. Szuchnik
Roczniki Chem., **30**, 73–85 (1956): *Chem. Abs.*, **50**, 12483 (10 Sept. 1956)

Heating 2:6-dimethyl-4-pyrone with dimethyl or diethyl sulphate and then adding aq. KI or $NaClO_4$ yields salts of (6-methyl-4-alkoxypyronium)-2:4′-(2′:6′-dimethylpyrone)cyanine. Preparation of several such dyes is described and data are given about them. C.O.C.

Condensation Products of Malononitrile and certain Cyclic Keto-amines
P. I. Ittyerah and F. G. Mann
J.C.S., 3179–3183 (Aug. 1956)

Malononitrile condenses with 1-substituted 1:2:3:4-tetrahydro-4-oxoquinolines to give bright red deriv. of the *merocyanine* type (I). Similarly, 1:6-dioxojulolidine reacts with the nitrile (2·4 equiv.) to give a mixture of the deep red 1-dicyanomethylene deriv. (II: $R^1 = R^2 = H$) and the deep purple 1:6-bisdicyanomethylene deriv. (III: $R^1 = R^2 = H$). 7-Methyl-1:6-dioxojulolidine, however, gives only the red dicyanomethylene deriv. (II: $R^1 = CH_3$; $R^2 = H$), whereas the 7:9-dimethyl deriv. (II: $R^1 = R^2 = CH_3$) does not react with malononitrile; this steric hindrance cannot be exerted by substituents in the 8-position, and both 8-chloro- and 8-phenyl-1:6-dioxojulolidine give deep red 1-dicyanomethylene deriv. and dark purple 1:6-bis-dicyanomethylene deriv. The properties, structures, and photographic sensitisation of these products are discussed.



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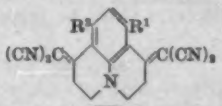


(III) H.H.H.

Trinuclear Dyes related to Oxonols. II— Formation and Absorption Spectra
R. A. Jeffreys
J.C.S., 2991–2995 (Aug. 1956)

Trinuclear oxonol dyes and some dimethin*merocyanines* are obtained from the reaction of a 2- or a 4-methyl heterocyclic quaternary salt (1 mol.) with an ethoxymethylene deriv. of a ketomethylene heterocyclic cpd. (2 mol.) and triethylamine (2 mol.) in boiling ethanol for 30 min., in ethanol at 20–40°c. for 1 hr., or in boiling pyridine for 30 min. Steric and electronic limitations to the formation of these dyes are formulated; with similar dyes prepared by Hamer, Rathbone, and Winton (cf. *J.C.S.*, 1113 (1949)), they are considered to be chain-substituted mesoionic oxonols. H.H.H.

Perimidine Dyes. A New Reaction
R. A. Jeffreys
Compt. rend. 27e Congr. intern. Chim. ind., Brussels, **3** (1954): *Industrie chim. belge*, **20** (Spec. No.), 618–621 (1955): *Chem. Abs.*, **50**, 11865 (10 Sept. 1956)

The scope of trinuclear dye formation was determined in alcohol in presence of triethylamine by condensing 5-ethoxymethylene-2-ethylthio-5-thiazolone with various quaternary salts, e.g. 2- and 4-picoline, 2-methyl-4:5-diphenyloxazole, and thiazole, lepidine, and quinaldine. Only in the case of 4-picoline was a trinuclear dye formed, indicating that the trinuclear dyes are formed only when the 2-methyl quaternary salt intermediate is derived from a heterocyclic base having strong electron-releasing power. The trinuclear dyes are photographic sensitisers, and have high molecular extinction coefficients, implying that resonance interaction occurs between coplanar nuclei. Models show how the third nucleus is forced out of the plane of dye resonance. C.O.C.

Polyacetylenes. XVIII— Light Absorption of Polyynenitriles
F. Bohlmann and H.-J. Mannhardt
Chem. Ber., **89**, 2268–2272 (Oct. 1956)

The effect on the ultraviolet absorption of a C:C triple bond is closely imitated by the cyano group. H.E.N.

Thiazoles. II— Preparation of 4-Alkyl-2-nitraminothiazoles
S. Kasman and A. Taurins
Canadian J. Chem., **34**, 1261–1270 (Sept. 1956)

Thiazoles. XXX— New Type of Thiazole Compound: Thiazole Blue
H. Beyer, C.-F. Kröger, G. Berg, C. Bischoff, and M. Zander
Chem. Ber., **89**, 2230–2239 (Oct. 1956)

2-Anilino-4-phenylthiazole, di(4-phenylthiazol-2-yl)amine, the thiazol-2-ylhydrazones of acetophenone and of benzaldehyde, and *NN'*-diphenyl-*N'*-(4-R-thiazol-2-yl)hydrazine (R = methyl or phenyl), in all of which position 5 of the thiazole nucleus is free, are oxidised by a variety of reagents in neutral soln. to 2:2'-diimino-$\Delta^{5,5'}$-dithiazolin-5:5'-ylidenes, which are violet to blue. H.E.N.

Benziminazol-2-aldehyde
H. Baganz
Angew. Chem., **68**, 151–152 (Feb. 1956)

o-Phenylenediamine is condensed with dichloroacetic acid, and the 2-dichloromethylbenziminazole, formed in 65% yield, is heated with powdered oxalic acid to give the aldehyde (80%). H.E.N.

Hydrogen Bonds in Indoaniline Dyes.
G. D. Bagratishvili, D. N. Shigorin, and N. S. Spasokukotskiĭ
Zhur. fiz. khim., **28**, 2185–8 (1954):
Chem. Abs., **50**, 11116 (25 Aug. 1956)

The absorption spectra in the 2·5–10·0 μ region were measured for *N*-(*p*-diethylanilino)naphtho-*p*-quinoneimine (QH) (I) and the following 2-substituted derivatives thereof: $QCOOCH_3$ (II), QCOOH (III), $QCON(C_6H_5)_2$ (IV), $QCON(C_2H_5)$ (V), $QCONHC_2H_5$ (VI), $QCONH_2$ (VII), $QSO_2N(C_6H_5)_2$ (VIII) and $QSO_2NHC_2H_5$ (IX) in the solid phase; the substituents were all in the position adjacent to the quinone group. Tables are given of the wave no. of all C:O bond vibrations. Absorption maxima for I–IX occur at 625, 660, 737, 642, 636, 678, 680, 688 and 680 mμ. respectively. H bonds are formed between NH (or OH) and C:O groups; this leads to marked shift of the long wave maximum of the electronic absorption spectrum towards longer wavelengths. C.O.C.

Reactions of 2-Nitrodiphenyl Sulphide and Related Sulphones in Attempted Ring-closure
D. L. Vivian and H. C. Waterman
J. Org. Chem., **21**, 914–915 (Aug. 1956)

In attempting to synthesise phenothiazine by subjecting 2-nitrodiphenyl sulphide to the action of FeO at 275–285°c., 2:2'-bisphenylthioazobenzene was obtained. The corresponding sulphone and its 4- and 5-chloro deriv. were reduced to the amines by the same procedure. H.E.N.

Phenazine Syntheses. VI— *N*-Methylphenazinium Methyl Sulphates. VII— Some Disubstituted Phenazines
D. L. Vivian
J. Org. Chem., **21**, 822–825 (July 1956)

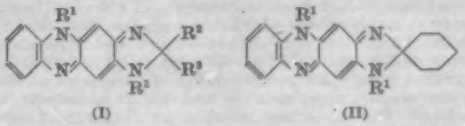
Preparation of Azines of Unsaturated 3-Ketosteroids
H. Dannenberg, H. Scheurlen, and I. Simmer-Rühle
Annalen, **600**, 68–80 (Oct. 1956)

Unexpected Anomalies in the Behaviour of Neutral Red and Related Dyes
D. L. Vivian and M. Belkin
Nature, **178**, 154 (21 July 1956)

2-Amino-8-*NN*-dimethylaminophenazine, the corresponding 3-methyl derivative (the colour base of Neutral Red), 8-amino-2-phenazinol, and 2-amino-7-*NN*-dimethylaminophenazine have been synthesised unambiguously by the action of aqueous ammonia on the appropriate halogenated *NN*-dimethylaminophenazines or 2-phenazinol in a bomb. None of the synthetic dyes, when dissolved in dil. HCl and neutralised, would stain species of *Amoeba* or other tissues which could be stained with purified samples of the commercial dyes. The synthetic and commercial dyes have different m.p. and give different colours with conc. H_2SO_4. However, the 2:8-substituted synthetic bases gave staining forms on being dissolved in conc. H_2SO_4, diluted, and precipitated with NH_4OH. Neutral Red is obtained in a third, non-staining form by precipitation with NH_4OH directly from soln. in conc. H_2SO_4. A.J.

Oxidation of Derivatives of *o*-Phenylenediamine. IV— New Series of Glyoxalinophenazines derived from Anilino*apo*safranines and their Behaviour on Hydrogenation
V. C. Barry, J. G. Belton, J. F. O'Sullivan, and D. Twomey
J.C.S., 3347–3350 (Sept. 1956)

Certain ketones condense with anilino*apo*safranine deriv. to give glyoxalinophenazines (I), which are yellow to orange–red cpd. exhibiting a greenish-yellow fluorescence in soln. The same products are formed from suitable *o*-phenylenediamine deriv. by oxidation in the presence of the ketone. Catalytic hydrogenation of the glyoxalinophenazine yields in most cases substituted anilino*apo*safranines containing a further substituent in the N^2-position; on exposure to the air the colourless soln. rapidly became dark red, and cpd. of structure II separate.



(I) (II)

H.H.H.

Use of Aniline Black for Purifying Direct Dyes
Z. Madrzycki
Przemysł Włókienniczy, **9**, *Biul. Inst. Włókienniczy*, **7**, 20, 21 (1955):
Chem. Abs., **50**, 12483 (10 Sept. 1956)

Direct Blue 6B Extra (50% dye) was treated with Aniline Black (from aniline, $CuSO_4$, $NaClO_3$ and NH_4Cl) in aq. soln. at 100°c. for 1 hr. The resulting compound was filtered and washed with hot water through a Schott funnel until there was no Cl^-. It was then decomposed with the theoretical amount of NaOH to bring the dye into solution. This solution was concentrated and the dye precipitated with alkali. Measured with a Visomat colorimeter there was 32% difference in strength between the treated and untreated dye. C.O.C.

Indophenols for Sulphur Dyes. XII— Arrhenius Energy of Indophenol Synthesis
S. Morikawa, O. Manuabe, and H. Hiyama
Science & Industry (Japan), **30**, 19–22 (1956):
Chem. Abs., **50**, 10496 (10 Aug. 1956)

In the synthesis of indophenol from *p*-nitrophenol and *o*-methylaniline the Arrhenius (activation) energy varies with the H_2SO_4 conc. Assuming that the reaction is between the conjugated acid of the phenol and the free amine then the reaction velocity is $d[In]/dt = k$[total *p*-nitrophenol] [total amine], (In = indophenol). From this it follows that $k = k'$[phenol conjugated acid] [free amine]/[total phenol] [total amine]. The Arrhenius equation derived from this shows the apparent Arrhenius energy varying with the H_2SO_4 conc. C.O.C.

Improvement of the Quality of Sulphur Dyes resulting from Study of the Physicochemical and Colloidal Properties
E. M. Aleksandrova and V. K. Laryushkina
Colloid J. (U.S.S.R.), **17**, 393–397 (1955)
(English translation)

Rearrangements of Hydroxybisbenzoquinonyls. I— Preparation of 2-Hydroxy-6:6'-dimethyl-3:3'-bisbenzoquinonyl and 2:2':5:5':6-Pentahydroxy-4:4'-dimethoxydiphenyl
T. Posternak, W. Alcalay, and R. Huguenin
Helv. Chim. Acta, **39**, 1556–1563 (Oct. 1956)

Structure of the Dyes from Glucuronic Acid and Naphthoresorcinol
T. Momose, Y. Ueda, and M. Iwasaki
Pharm. Bull. (Japan), **3**, 321–322 (1955)

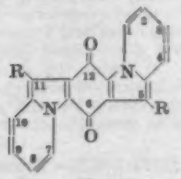
Naphthaquinone Series. VI— 2-Alkylamino-3-chloro-1:4-naphthaquinones and 2-Arylamino-3-chloro-1:4-naphthaquinones
T. V. Acharya and B. D. Tilak
J. Sci. Ind. Research (India), **14B**, 219–222 (1955):
Chem. Abs., **50**, 12004 (10 Sept. 1956)

2·5 Moles of amine in alcohol were added to a boiling alcoholic soln. of 2:3-dichloro-1:4-naphthoquinone, refluxed 4–5 hr., cooled, the crystals filtered off, washed with alcohol and recrystallised. Evaporation of the filtrate gave additional material which was washed with hot dil. HCl

and recrystallised. The following were prepared (amine used, % yield, colour): 2-chloroaniline, 30, orange red; 2:4-dichloroaniline, 20, orange yellow; morpholine, 64, red; piperidine, 50, red; 3-aminocarbazole, 66, blue; dehydrothiotoluidine, 70, bright red; primuline base, 5, brownish red; $C_{12}H_{25}NH_2$, 78, scarlet; $C_{12}H_{27}NH_2$, 86, scarlet; *cyclo*hexylamine, 35, bright red; $HO(CH_2)_2NH_2$, 98, orange. 2-Anilino-3-chloro-1:4-naphthoquinone with aq. NaOH and $Na_2S_2O_4$ 30 min. at 60°c. gave 2-anilino-3-hydroxy-1:4-naphthoquinone and 2-chloro-3-hydroxy-1:4-naphthoquinone. Dyeing properties are listed. C.O.C.

Reaction of Chloranil with Acetylacetone in the presence of Pyridine
B. D. Tilak and M. R. Venkiteswaran
Chem. and Ind., R.33–R.34 (April 1956)

Chromatographic separation on alumina of the condensation product from the reaction of chloranil, acetylacetone, and pyridine afforded the isomeric 5:11-diacetylbenzo-(1:2-*b*, 4:5-*b'*)-(I: R = CO·CH_3)- and 5:7-diacetylbenzo-(1:2-*b*, 5:4-*b'*)-(II: R = CO·CH_3)-dipyrrocoline-6:12-quinone, in which I predominated. In the reaction of *p*-benzoquinone, acetylacetone, and pyridine, only II was isolated. The recent work of Islam and Raphael (cf. *Chem. and Ind.*, 1635 (1955)) therefore needs modification in the light of these results. Reaction of chloranil, dibenzoylmethane, and pyridine likewise gave a mixture of isomeric dibenzoylbenzodipyrrocolinequinones (I: R = CO·C_6H_5; II: R = CO·C_6H_5). Reaction of chloranil (1 mol.), ethyl acetoacetate (1 mol.), and pyridine (2 mol.) in absolute ethanol gave 5-carbethoxy-7:8-dichlorobenzo-(1:2-*b*)pyrrocoline-6:9-quinone (III).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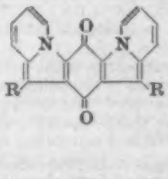
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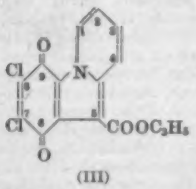

(III)

H.H.H.

Halogen Reactivities. VII— Kinetic Study of Displacement Reaction of Benzene, Naphthalene, and Anthracene Halides with Piperidine
A. Richardson, K. R. Brower, and E. D. Amstutz
J. Org. Chem., **21**, 890–891 (Aug. 1956)

9-Amino-10-nitroanthracene
S. Hünig and K. Requardt
Angew. Chem., **68**, 152 (Feb. 1956)

The cpd. is prepared from 9-nitroanthracene by reaction with bromine and pyridine, followed by methanolic methylamine. It forms black–red crystals, cannot be diazotised nor titrated with perchloric acid in acetic acid, and is hydrolysed to anthraquinone by acids and bases. These properties demonstrate the importance of the polar, quinonoid form. H.E.N.

Leuco Bases of Anthraquinones. I— Synthesis and Dielectric Polarisation of 9-Anthranol
K. Nukada and Y. Bansho
Repts. Govt. Chem. Ind. Research Inst., Tokyo **49**, 15–23 (1954)

Synthesis of *x*-Chloro-1-aza-anthraquinone from 9-Chloro-1-aza-anthracene by Chlorination and Oxidation
M. Yokote and S. Suzuki
J. Chem. Soc. Japan, Ind. Chem. Sect., **58**, 678–680 (1955): *Chem. Abs.*, **50**, 11304 (25 Aug. 1956)

9-Chloro-1-aza-anthracene treated with Cl_2 gas in nitrobenzene followed by adding alcohol, filtering and washing with alcohol yielded crude 9:10:*x*-trichloro-1-aza-anthracene (I). This was dissolved in glacial acetic acid, CrO_3 added and boiled for 1 hr. to give *x*-chloro-1-azaanthracene (II). This (0·458 g.), 1-aminoanthraquinone (0·675), $CaCl_2$ (0·69), K_2CO_3 (0·798) and nitrobenzene (9) boiled for 15 hr. gave a blacked dye, purified by vacuum sublimation. The purified dye in *o*-dichlorobenzene had an absorption spectrum having a maximum at 4800A, as Indanthren Orange 6RTK has a maximum at 4900A, the Cl in II is presumed to be in the β-position. C.O.C.

Condensates of *x*-Bromo-1-aza-anthraquinone with 1- or 2-Aminoanthraquinone
M. Yokote, S. Ishigaki, and S. Suzuki
J. Chem. Soc. Japan, Ind. Chem. Sect., **58**, 932–934 (1955): *Chem. Abs.*, **50**, 12481 (10 Sept. 1956)

x-Bromo-1-azanthraquinone (1 mole) was subjected to imide condensation with 1-aminoanthraquinone (1·3 mole) in presence of CuO, K_2CO_3 and naphthalene at 210°c. for 12 hr. The alcohol-insoluble part of the product gave a dye which gave violet-brown with H_2SO_4 and a reddish orange vat which dyed cotton orange. The absorption spectra of the dye and Indanthren Orange 6RTK in *o*-dichlorobenzene have maxima at 4800 and 4900A. respectively. Similar preparation using 2-amino anthraquinone yielded a dye of nearly the same colour. The absorption maxima of the dye and 2:2'-dianthraimide in *o*-dichlorobenzene were 4400 and 4300A. respectively. C.O.C.

Thermochromism. V— Optical Activation of Dehydrodianthrone-3-carboxylic Acid. The Cause of Thermochromism
W. Theilacker, G. Kortüm, and H. Elliehausen
Chem. Ber., **89**, 2306–2318 (Oct. 1956)

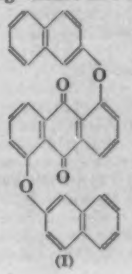
The quinine salt of dehydrodianthrone-3-carboxylic acid mutarotates, but that of the 3:6'-dicarboxylic acid does not. From considerations of symmetry, this is strong evidence that the pale-coloured ground state is a molecule in which each anthrone system is folded, and not one in which the two anthrone systems are planar but at an angle to each other. The latter configuration is, however, that of the strongly coloured form, which is also diamagnetic. In the case of dehydrodianthrones, thermochromism is thus due to *constellation isomerism* and not to valence tautomerism. H.E.N.

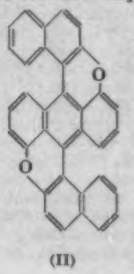
Magnetochemical Study of Dianthraquinone and its Thermochromism in the Solid State
Y. Matsunaga
Bull. Chem. Soc. Japan, **29**, 582–586 (July 1956)

Measurement of the magnetic susceptibility of dianthraquinone and seven related compounds shows the molar susceptibility of dianthraquinone to be low. This is attributed to localisation of electrons at the central ethylenic bond. On heating dianthraquinone a thermochromic change occurs (yellow to dark green) accompanied by a marked decrease in susceptibility and a loss of sharp X-ray diffraction patterns. The thermochromic change is considered to be an irreversible chemical one. A.J.

Benzo[*a*]perylene and some of its Derivatives
E. Clar, W. Kelly, D. C. Stewart, and J. W. Wright
J.C.S., 2652–2656 (Aug. 1956)

Dinaphthyloxyanthraquinone (I) condenses in an NaCl–$AlCl_3$ melt to polycyclic oxides (II–IV). Reduction of III with HI and red P at 210°c. followed by dehydrogenation with Pd–C gives benzo[*a*]perylene (VI), also obtained from dinaphthylanthracene (V) by drastic treatment in an NaCl–$AlCl_3$ melt at 160°c. If the ring-closure of 9:10-dihydro-9:10-dihydroxy-9:10-di-1'-naphthylanthracene (VII) is carried out at 110°c., 3-1'-naphthylbenzo[*a*]-perylene (VIII) is formed; this cpd. is also obtained by ring-closure of 1-chloro-9:10-di-1'-naphthylanthracene.


(I)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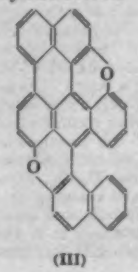
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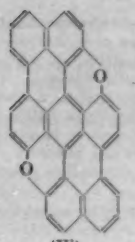
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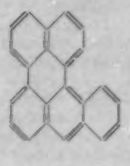
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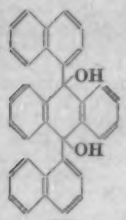
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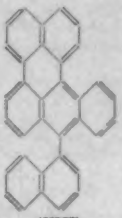
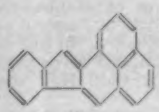

(VIII)

H.H.H.

Synthesis of Indeno[2,1-*a*]perinaphthene
I. M. Aitken and D. H. Reid
J.C.S., 3487–3495 (Sept. 1956)

The title substance (I) has been synthesised, and the following properties have been reported— (i) It has a strongly basic character; it dissolves reversibly in 77% H_2SO_4 or anhydrous liquid hydrogen fluoride to form a green cation. (ii) It functions readily as the diene component in Diels–Alder reactions. (iii) It readily undergoes electrophilic substitution. (iv) It gives a new type of reaction with lead tetra-acetate involving intermol. dehydrogenation. This is the first synthesis of a cpd. containing the ring system of *cyclo*penta[*a*]perinaphthene (II).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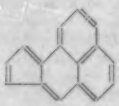

(II)

H.H.H.

Electrophilic Substitution
III— Nitration of Phenanthrene
M. J. S. Dewar and E. W. T. Warford
J.C.S., 3570–3572 (Sept. 1956)

IV— Nitration of Diphenyl, Chrysene, Benzo[*a*]-pyrene, and Anthanthrene
M. J. S. Dewar, T. Mole, D. S. Urch, and E. W. T. Warford
Ibid., 3572–3575

V— Competitive Nitrations
M. J. S. Dewar, T. Mole, and E. W. T. Warford
Ibid., 3576–3580

VI— Nitration of Aromatic Hydrocarbons; Partial Rate Factors and their Interpretation
M. J. S. Dewar, T. Mole, and E. W. T. Warford
Ibid., 3581–3586

Proton Complexes of Pyrene
E. L. Mackor and A. Hofstra
Rec. Trav. chim., **75**, 871–877 (June 1956)

Addition of Alkali Metal to Pyrene— I
O. Neunhoeffer and H. Woggon
Annalen, **600**, 34–46 (Oct. 1956)

In view of the theoretical possibility of adding two radicals to the central bond of pyrene (I) to give a cyclic polyene, the interaction of I and alkali metals was studied. I adds 1 atom of alkali metal readily in ether, instantly in liquid ammonia. In presence of alcohol, a blue–green pyrene radical is formed, the soln. being decolorised on addition of diphenylpicrylhydrazyl. CO_2 gives the 4-carboxylic acid (II) and a mixture of two dicarboxylic acids. II is synthesised from hexahydropyrene by Friedel–Crafts acetylation, oxidation with NaOCl, esterification, and dehydrogenation. H.E.N.

Complexes in Coal
J. Schuyer
Rec. Trav. chim., **75**, 878–884 (June 1956)

An attempt to explain the black colour of coal in terms of lamellae formed from complexes of polycyclic aromatic compounds. C.J.W.H.

Synthesis of Steranthrene. VIII— Synthesis of Aceperinaphthane Derivatives
H. Dannenberg and S. Läufer
Chem. Ber., **89**, 2242–2252 (Oct. 1956)

Oxidation of Fluorene Derivatives by Potassium Persulphate
H. R. Gutmann, J. G. Burtle, and S. W. Fenton
J. Org. Chem., **21**, 866–868 (Aug. 1956)

Nitration of 2-Acylaminofluorene Derivatives
E. Sawicki, B. Chastain, and H. Bryant
J. Org. Chem., **21**, 754–756 (July 1956)

The nitration of 2-acetylaminofluorene, a strong carcinogen, occurs about 60% at position 3, 25% at 7, and $< 1\%$ at 1. Blocking position 7 with a methyl or an ethyl group increases the yield of 3-nitro deriv. to 80–90%. Replacement of the acetyl group by methanesulphonyl also increases the yield of 3-nitro deriv. to about 80%, but nitration of 2-*n*-perfluorobutyrylaminofluorene occurs in 80% yield at position 7. H.E.N.

Polycyclic Dyes
N. S. Dokunikhin, A. M. Fomicheva, and N. I. Abramova
J. Appl. Chem. U.S.S.R., **29**, 930–935 (June 1956)

Six analogues of the well known triad of isomeric dibenzamidoanthraquinone–carbazoles (*C.I.*1150, 1151, and their golden-orange isomer) are prepared in which the benzamido groups are replaced by 3-arylureido groups (aryl = phenyl, *p*-chlorophenyl, and 2-anthraquinonyl). Dyeings of these on cotton are of moderate to good fastness to wet treatments, but are of poor fastness to light. A.E.S.

Polynuclear Heterocyclic Systems. XI— Absorption Spectra of Compounds containing Five-membered Rings
G. M. Badger and B. J. Christie
J.C.S., 3438–3442 (Sept. 1956)

Absorption spectra of polycyclic cpd. derived from five-membered heterocyclic systems resemble those of the related benzenoid hydrocarbons. Three main absorption regions can generally be resolved whose chief differences are— (i) the absorption of the heterocyclic cpd. (particularly of the group I bands) is shifted to shorter wavelengths, and (ii) the group III bands are more intense than those given by the hydrocarbons. The spectra of dicyclic and tricyclic furan systems resemble those of the related hydrocarbons rather less closely. The absorption curves for the following cpd. are compared— naphthalene, thionaphthen, indole, and benzofuran; phenanthrene, dibenzothiophen, carbazole, and dibenzofuran; 1:2-benzanthracene, 9-thia-2:3-benzofluorene, 2:3-benzocarbazole, and β-brazan; chrysene, 9-thia-1:2-benzofluorene, 1:2-benzocarbazole, and 4:5′-benzofurano(1′:2′-1:2)naphthalene; 3:4-benzophenanthrene, 9-thia-3:4-benzofluorene, and 3:4-benzocarbazole; dibenzothiophen, dibenzothiophen 9-oxide, and dibenzothiophen 9:9-dioxide; 9-thia-2:3-benzofluorene and 9-thia-2:3-benzofluorene 9:9-dioxide; 9-thia-1:2-benzofluorene, and 9-thia-1:2-benzofluorene 9:9-dioxide; 9-thia-3:4-benzofluorene, 9-thia-3:4-benzofluorene 9-oxide, and 9-thia-3:4-benzofluorene 9:9-dioxide. H.H.H.

Kinetic Studies of Polycyclic Aromatic Hydrocarbons. IV— 3:4-Benzophenanthrene
J. Brändli, E. Dujardin, P. J. C. Fierens, R. H. Martin, and M. Planchon
Helv. Chim. Acta, **39**, 1501–1506 (Oct. 1956)

Solvolysis and S_N2 exchange with KI of the 2-chloromethyl deriv. and alkaline hydrolysis of the ethyl 2-carboxylate show that the reactivities are comparable with those of the corresponding 9-phenanthryl cpd. The non-planarity of 3:4-benzophenanthrene is therefore practically without effect on the reactivity of these substituents. H.E.N.

Synthesis of Terrylene and Quaterrylene and the Alleged Quaterrylene of Zinke
E. Clar, W. Kelly, and R. M. Laird
Mh. Chem., **87**, 391–398 (June 1956)

2:3-Dichloro-1:4-naphthaquinone forms a diol on reaction with naphthylmagnesium bromide, which is

reduced with HI in acetic acid and then cyclised with $NaCl–AlCl_3$ at 115°C. for 5 min. to 7:8-dichloroterrylene. HI and red phosphorus yield octahydroterrylene, converted to terrylene (I) on dehydrogenation with Pd–charcoal. I is obtained in red–violet plates, m.p. 510–511°C., λ_{max} 560 mμ., from trichlorobenzene. It forms the main component (80–90%) of the condensation product from perylene (II) and 1-bromonaphthalene. Zinke's "quaterrylene" (J.S.D.C., **72**, 179 (April 1956)) is obviously this terrylene. The condensation of II in $NaCl–AlCl_3$ at 120–150°C. for 20 min. yields 30% of unchanged II, about 4% of a readily sublimed red–brown hydrocarbon, m.p. 467–469°C., λ_{max} 527 mμ., and about 15% of a dark green substance (III), difficult to sublime, m.p. 570°C., λ_{max} 673 mμ., but none of Zinke's cpd., λ_{max} 560 mμ. To III is assigned the structure of quaterrylene, i.e. bis-3:4-perylenylene. H.E.N.

Electronic Structures of Azine Compounds
Y. Akimoto

I—The Molecular Structures and Electronic States of Fluoflavine and Fluorubine
Bull. Chem. Soc. Japan, **29**, 460–464 (June 1956)

For fluoflavine (I) and fluorubine (II) in *n*-propanol soln. the π–π transitions of longest wavelength occur at 22,500 cm.$^{-1}$ and 23,000 cm.$^{-1}$ respectively. An n–π transition is observed at 21,000 cm.$^{-1}$ for II but is not seen for I. By application of molecular-orbital theory and the second-order perturbation method the observed blue shift from I to II is explained if I is 5:11-dihydro-5:6:11:12-tetra-azanaphthacene and II is 6:13-dihydro-5:6:7:12:13:14-hexa-azapentacene rather than other possible dihydro isomers.

II—General Considerations on the Electronic Structures of Azine and Dihydroazine Compounds
Ibid., 553–559 (July 1956)
A.J.

Intermolecular Hydrogen Bonding in Indigoid Dyes
S. J. Holt

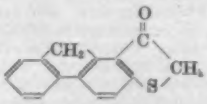
Chem. Soc. Spec. Publ. (4), 42–43 (1956)

Hydrogen-bonding in indigo is suggested to be inter- not intra-molecular on the basis of the m.p. and solubilities of its deriv. and von Eller's crystallographic studies.
H.E.N.

Indigoid Dyes. XVIII—Thio-indigoid Dyes from Fluorene-2-sulphonic Acid
P. C. Dutta and D. Mandal

J. Indian Chem. Soc., **33**, 410–414 (June 1956)

4:5-Fluoreno-3-hydroxy-1-thiophen (I), which was obtained from fluorene-2-sulphonic acid via the thiol and thioglycollic acid, on condensing with α-diketones such as glyoxal, isatin and acenaphthene quinone and their halogeno and nitro-derivatives, phenanthraquinone, and acenanthraquinone, gave dyes which were only sparingly soluble in alkaline hydrosulphite and dyed cotton pale purples, blues, and browns. Oxidation of the thiophen compound (I) gave only poor yields of the corresponding thio-indigo.

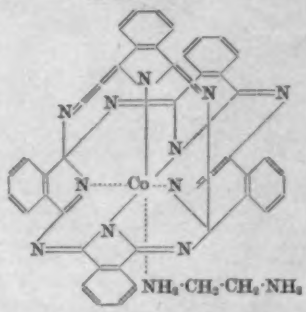


(I) C.H.R.

***iso*Indolenines as Intermediates in the Synthesis of Phthalocyanines**
F. Baumann, B. Bienert, G. Rösch, H. Vollmann, and W. Wolf

Angew. Chem., **68**, 133–150 (Feb. 1956)

A comprehensive review giving references and recipes for the prepn. of many of the cpd. mentioned. In describing the prepn. and properties of alkoxy- (I), mercapto- (II), and amino-imino*iso*indolenines (III), it is stated that red basic dyes, exhibiting a yellow fluorescence in soln., can be obtained by condensation of I or III with secondary amines, such as morpholine or piperidine, acetone, and an acid. Under conditions like those used in the addition of alcohols or amines to *o*-dinitriles, the monomolecular *iso*indolenines condense to form poly*iso*indolenines (IV) containing 2–6 units, there being some similarity in this condensation to indamine formation. IV exhibit characteristic behaviour on vatting. I–IV form complexes with metals. The metal complexes of IV can also be prepared by oxidation of phthalocyanine (V) and they are readily reconverted to V by reduction. The ease of hydrolysis of IV is lowered by complex formation to an extent dependent on the strength of the secondary bonds formed. The properties of I, III, and IV are summarised in a useful table. Formula VI is assigned to Phtalogen Blue IB (BASF), which is prepared from phthalonitrile in two steps, cobalt V being an intermediate which is not isolated. VI is soluble, for instance, in 5% acetic acid, and is printed together with reducing agents,



(VI)

such as quinol. Phtalogen Blue IF3G is the parent III and Phtalogen Green IFFB its 5-phenyl deriv. These decompose appreciably in aq. soln. They are applied together with a salt, preferably complex, of Cu or Ni, and an organic liquid which acts as a reducing agent and as a solvent for the less sol. IV formed as intermediates during development. Reserve effects can be obtained in this process, for instance, by use of strong primary aliphatic amines, which replace the amino and imino groups. H.E.N.

Derivatives of Phthalocyanine
D. Colaïtis

Compt. rend. Acad. Sci. Paris, **242**, 1026–1031 (1956): *Chem. Abs.*, **50**, 12036 (10 Sept. 1956)

The Ga and In derivatives of phthalocyanine were prepared from *o*-cyanobenzamide by fusing 6 parts of the nitrile with the appropriate trihalide. In this way RGaCl, RInCl, and RInI ($R = C_{32}H_{16}N_8$) were prepared; on hydrolysis with conc. H_2SO_4 then H_2O they yielded RGaOH and RInOH. C.O.C.

Synthesis of Azaporphins and Related Macrocycles
J. A. Elvidge

Chem. Soc. Spec. Publ. (4), 28–41 (1956)

After a review of the published work of Linstead's school on the synthesis from imidines, current research is described. For instance, 1:3-diimino*iso*indoline (1-amino-3-imino*iso*indolenine) (I) will condense with *m*-phenylenediamine (II) in the cold to give a 2:1 addition cpd. This on heating in butanol is converted into a mixture of macrocycles in which the fourth position is occupied either by another mol. of I or by II. The preparation of tribenzotetra-azaporphin from 3 mol. of I and 1 mol. of succinimidine (III) is improved by the addition of maleic acid and sodium chlorate, purification of the pigment being effected by chromatography on tartaric acid or kieselguhr. Similar cpd. are obtained using dimethylsuccinimidine or 3:4:5:6-tetrahydrophthalimidine in place of III.
H.E.N.

Location of Free Electrons in Porphin Ring Complexes
J. F. Gibson and D. J. E. Ingram

Nature, **178**, 871–872 (20 Oct. 1956)

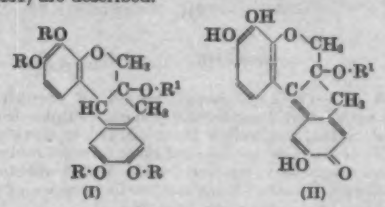
The oxidation reaction (by H_2O_2, KIO_4, etc.) of haemoglobin and myoglobin has been investigated by electron resonance methods, and the results show that a radical species is formed for the oxidation state with very little interaction between the unpaired electron and the central iron atom. The spectra observed, when compared with those obtained from the intermediate states formed during the oxidation of tetraphenylporphin and phthalocyanine deriv., indicate that the orbits of the free electrons are very similar in all three cases, and embrace a considerable portion of the conjugated ring structure. No hyperfine structure has been observed on any of the spectra obtained from the porphin intermediates, showing that the orbit of the unpaired electron is not confined near the nitrogens

in the centre of the ring, but probably includes most of the carbon atoms. H.H.H.

Biogenesis of Brazilin and Haematoxylin
W. B. Whalley
Chem. and Ind., 1049–1050 (6 Oct. 1956)

Reactions of Haematoxylin
D. J. Duff
J.C.S., 3296–3298 (Sept. 1956)

Haematein (II: R′ = H), the colouring matter of logwood, is not present in the fresh wood, but is derived by oxidation of colourless haematoxylin (I: R = R′ = H). Oxidising agents generally convert I into II, and oxidation by diazonium salts is accompanied by quant. evolution of N_2, while nitroso cpd. in boiling alcohol oxidise without azine formation. Halogen deriv. of I cannot be prepared directly, but are readily obtained by halogenation of penta - *O* - acetylhaematoxylin (I: R = R′ = CH_3·CO) followed by hydrolysis, and subsequent oxidation yields the cryst. deriv. of II. The four phenolic OH groups in I are more readily alkylated than is the alcoholic OH group. I condenses readily with aldehydes, and benzylidenehaematoxylin, its sulphonic acid, and anhydrohaematoxylone (III) are described.



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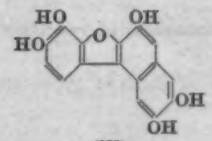


(III) H.H.H.

Colouring Matters of the Wood of *Artocarpus integrifolia*. I— Artocarpin
K. G. Dave and K. Venkataraman
J. Sci. Ind. Res., 1956, **15 B**, (4), 183–190 (1956)

A new colouring matter, artocarpin (I), has been isolated from the heartwood of *Artocarpus integrifolia*. Analysis agrees with the mol. formula $C_{16}H_{20}O_6$ or $C_{16}H_{18}O_6$. I is shown to have a γ-pyrene structure and to contain one $-CH_3$ group and three phenolic $-OH$, of which one cannot be methylated. Alkali fusion of the dimethyl ether of I gives β-resorcylic, 2-hydroxy-4-methoxybenzoic, acetic, and *iso*valeric acids and *iso*amyl alcohol. Oxidation gives *iso*valeric and 2:4-dimethoxybenzoic acids and a hydroxy-trimethoxy-*C*-methylflavonedicarboxylic acid. These results indicate that I is probably 5:2′:4′-trihydroxy-7-methoxyflavone with alkenyl substituents in the 3- and 6-positions. A.J.

α-Gambogic Acid a Constituent of Gamboge
M. Amoroso and L. Lipparini
Ann. chim. (Rome), **45**, 977–982 (1955):
Chem. Abs., **50**, 12080 (10 Sept. 1956)

Gamboge contains 40–50% of α-gambogic acid, $C_{32}H_{34}O_4$, which with pyridine gives a compound $C_{34}H_{39}NO_4$. This boiled with acetic anhydride and anhydrous Na acetate for 2 hr. and poured into water after cooling yielded an oily product which solidified after a few days. This solid was washed with water, dissolved in a little alcohol and poured into aq. HCl. Recrystallisation from acetone and then alcohol yielded lemon yellow flakes of $C_{32}H_{32}O_5$ acetate, also obtained directly from α-gambogic acid. Alkaline oxidation of α-gambogic acid yielded $(CH_3)_2$·C(OH)COOH. C.O.C.

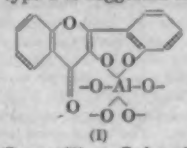
The Colouring Matters of *Garcinia morella*. I— Morellin
N. V. Bringi, K. H. Shah, and K. Venkataraman
J. Sci. Ind. Res. (India), **14 B**, 135–142 (1955):
Chem. Abs., **50**, 11328 (25 Aug. 1956)

Work which has enabled a partial constitution for morellin, an orange pigment found in the seeds of *G. morella*, to be advanced. C.O.C.

Major Anthocyanin Pigments of the Wild Strawberry (*Fragaria vesca*)
E. Sondheimer and C. B. Karash
Nature, **178**, 648–649 (22 Sept. 1956)

Aluminium Complexes of Flavonols
J. A. Ballantine and W. B. Whalley
J.C.S., 3224–3226 (Aug. 1956)

3:2′-Dimethoxy-6-methylflavone, when heated with $AlCl_3$ in nitrobenzene, gives a cryst. complex of the dihydroxyflavone and Al of the probable type (Flavone–2H)$_2$Al. 3:2′-Dihydroxyflavone furnished an analogous cryst. complex, from which the Al was not easily removed. A formulation of type I is suggested for these cpd.



(I) H.H.H.

Atrovenetin, a Crystalline Colouring Matter from *Penicillium atrovenetum*
G. Smith, K. G. Neill, and H. Raistrick
Chem. and Ind., 551–552 (23 June 1956)

Atrovenetin ($C_{19}H_{18}O_8$) is a brownish-yellow pigment isolated from *P. atrovenetum*. It contains a minimum of 4 OH groups, no O·CH_3, and 3 or 4 >C·CH_3 groups. A number of derivatives are described, including one pair each of isomeric mono-, tri-, and tetra-methyl ethers. The pigment is very stable (e.g. to boiling 2*N*-H_2SO_4 and fusion with KOH). Distillation of atrovenetin with Zn dust gives a small yield of pyrene. A.J.

Constitution of Herqueinone and Related Compounds
D. H. R. Barton, P. de Mayo, G. A. Morrison, W. H. Schaeppi, and H. Raistrick
Chem. and Ind., 552–553 (23 June 1956)

Norherqueinone ($C_{18}H_{18}O_7$) and its methyl ether, herqueinone, are isolated from *Penicillium herquei*. Reduction with zinc dust yields the corresponding desoxy compounds ($C_{19}H_{18}O_8$ and $C_{20}H_{20}O_8$). It is now shown that desoxynorherqueinone and atrovenetin (see above abstract) are identical. Herqueinone on acid hydrolysis yields xanthoherquin ($C_{18}H_{18}O_7$) and methyl *iso*propyl ketone. Comparison of the absorption spectra of various acetates of xanthoherquin, norxanthoherquin, desoxyherquin, and desoxynorherquin leads to the conclusion that these compounds are derivatives of 9-hydroxyperinaphthenone. A.J.

Synthetic Carotenoids
O. Isler, H. Lindlar, M. Montavon, R. Rüegg, G. Saucy, and P. Zeller
Chem. Soc. Spec. Publ. (4), 47–63 (1956)

β-Carotene is being produced in ton quantities by the process: β-ionone → C_{18}-β-aldehyde → 15:15′-dehydro-β-carotene. Dihydro-β-carotene and lycopene will soon be available. These and other syntheses are reviewed. H.E.N.

Autoxidation of Carotenoids. I— Autoxidation of α- and β-Carotene
C. Bodea and E. Nicoară
Acad. rep. populare Romîne, Studii cercetări chim., **3**, 81–91 (1955):
Chem. Abs., **50**, 11785 (10 Sept. 1956)

Autoxidation of α- (I) and β-carotene (II) in organic solvents has the following mechanism: on contact with air O is taken up at the 3 and 3′ C of the ionone rings to form peroxide groups that then give up one O atom to the system of conjugated double bonds. This explains the transformation of carotenes to xanthophylls *in vitro*. C.O.C.

Derivatives of Naphthaquinones. XIII— Pigments from Sea Urchins
C. Kuroda and M. Harada
Proc. Japan Acad., **31**, 305–308 (1955)

Colour of Ruby and of the $(Al,Cr)_2O_3$ Mixed Crystal
E. Thilo, J. Jander, and H. Seemann
Z. anorg. allgem. Chem., **279**, 2–17 (1955):
Chem. Abs., **50**, 10474 (10 Aug. 1956)

Mixed defect-free crystals of Al_2O_3-Cr_2O_3 are pure red up to approx. 8 mol. % Cr_2O_3, above which the green

colour of Cr_2O_3 begins to appear. The lattice constant, *d*, and reducibility curves also show inflections at 8 mol. % Cr_2O_3. This and magnetic-susceptibility determinations on the mixed crystal and on Cr_2O_3 suggest that Cr^{+++} in the mixed crystal exists at low concentrations as "red ions" with parallel electron spins, and with increasing Cr constant, as "green ions" in which electron coupling between adjacent ions results in increasing compensation. C.O.C.

Rapid Synthesis of Ultramarine
D. Lahiri and S. K. Banerjee
Indian Ceram., **2**, 277–281 (1955): *Chem. Abs.*, **50**, 11155 (25 Aug. 1956)

A series of reduced greens, containing 10·1–12·3% S, were produced, after 90 min. reduction at 850–900°c. The raw mixtures used were (a) anhydrous zeolite 40, S 50, anhydrous Na acetate 10; (b) processed clay 100, Na_2CO_3 102, S 200, and (c) processed clay–Na_2CO_3 mixture (kaolin 1, Na_2CO_3 0·8) 100, Na_2CO_3 20, S 200. The zeolite was prepared from Na aluminate and Na silicate and dried at 110°c. The processed clay was prepared from Rajmahal Indian clay; the Fe was removed with 2% HCl and the washed product calcined for 4 hr. at 550–600°c. The processed clay–Na_2CO_3 mixture was prepared by calcining for 4 hr. at 550–600°c. It seems that the good results from (a) were due to the special preparation of amorphous zeolite, from (b) the colloidal nature of the processed clay, and from (c) presence of loosely combined Na_2O, which converted readily to zeolite during calcination with S. The reduced greens were converted to the oxidised blue pigment by calcining for 2 hr. at 500°c. The highest S content was in (a). C.O.C.

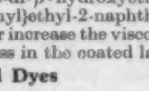
PATENTS

Colour Couplers
Kodak *BP* 757,368

Compounds of formula $R^1{\cdot}SO_2{\cdot}NR^2{\cdot}CXY{\cdot}CH_2OH$ (R^1 = a radical able to couple, R^2 = H or may, when X and Y both = H, be C_2H_4OH; X = H or CH_2OH; Y = H, CH_3 or CH_2OH) e.g. 1-hydroxy-4-chloro-N-(β-{4-[2-(2-4-di-*tert.*-amylphenoxy)-5-(3:5-di-β-hydroxyethylsulphamylbenzamido)benzamido]phenyl}ethyl-2-naphthamide, are colour couplers which neither increase the viscosity of the emulsion nor produce brittleness in the coated layer. C.O.C.

Red Monoazo Acid Dyes
S *BP* 756,624

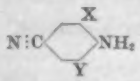
Diazotised 4-aryloxyaniline-2-sulphonic acids



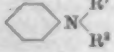
(R = phenyl which may be subst. by one or more Hal atoms or Alk, *cyclo*alkyl, aralkyl, aryl and/or alkoxy groups, or a 5:6:7:8-tetrahydronaphthyl (1 or 2) radical) are coupled under acid conditions with *N*-aryl-γ acids, especially *N*-2:4:6-trimethylphenyl-γ acid (I) to give bright red acid dyes applicable to wool, nylon, etc. from neutral or weakly acid baths. The diazo components may be prepared by heating the acid sulphates of suitable 4-aminodiaryl ethers; the SO_2H group thereby introduced into the *ortho* position to the NH_2 group, confers good light-fastness on the derived monoazo dyes. Thus 4-(2′:4′-dichloro-)phenoxyaniline-2-sulphonic acid diazotised and coupled with I in the presence of acetic acid yields a bluish red acid dye. E.S.

Water-soluble Monoazo Oranges and Reds for Cellulose Acetate and Nylon
ICI *BP* 757,361

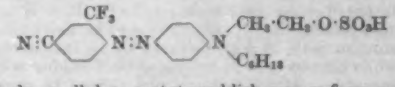
Water-soluble monoazo dyes giving oranges and reds on cellulose acetate and nylon similar in hue on both fibres are made by diazotising a *p*-cyanoaniline



(X = Hal or CF_3; Y = H or Hal) and coupling with a sulphatoalkylamine



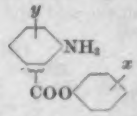
(Z = H, Hal, CH_3, or CF_3; R^1 = $-CH_2{\cdot}CH_2{\cdot}O{\cdot}SO_3H$, or $-CH_2{\cdot}CH_2{\cdot}CH_2{\cdot}O{\cdot}SO_3H$; R^2 = Alk of 1–6 C, β-phenylethyl, or β-phenoxyethyl in which the phenyl nuclei may bear substituents other than COOH or SO_3H). They may also be made by sulphating the dyes of *BP* 756,079 (J.S.D.C., **72**, 544 (Nov. 1956)). Thus 2-amino-5-cyanobenzotrifluoride dissolved in glacial acetic acid is diazotised by adding 36% aq. HCl followed by aq. $NaNO_2$. The diazo compound is then coupled with the Na salt of *N*-*n*-hexyl-*N*-β-hydroxyethylaniline sulphuric acid ester to give



which dyes cellulose acetate reddish-orange from a neutral bath and nylon from a formic acid bath. E.S.

Yellow Monoazo Acid Dyes
S *BP* 756,296

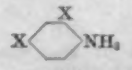
Acid dyes prepared by coupling diazotised 2(or 3)-amino-benzoic acid esters



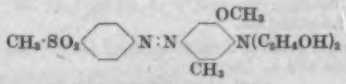
(*x* = Alk of 4–12 C, *cyclo*hexyl, benzyl, or phenyl; *y* = H or Cl) with 1-aryl-3-methyl-5-pyrazolonesulphonic acids, dye wool, nylon, etc. yellow from neutral or weakly acid baths. Thus the *p*-*n*-octylphenyl ester of *m*-aminobenzoic acid diazotised and coupled with 1-(2′:5′-dichloro-4′-sulphophenyl)-3-methyl-5-pyrazolone in presence of acetic acid yields a greenish yellow acid dye. E.S.

Bright Red Monoazo Disperse Dyes for Cellulose Acetate and Nylon
Ciba *BP* 756,578

The disperse dyes obtained by coupling a diazotised methylsulphonylaniline



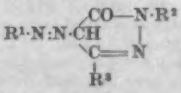
(one X = SO_2CH_3; the other = Cl or preferably H) with *NN*-di(β-hydroxyethyl)-*m*-toluidine or *NN*-di(β-hydroxyethyl)-*p*-cresidine (I) give bright reds on nylon as well as on cellulose acetate. The diazo components may be made by methylating a suitable nitrobenzenemonosulphinic acid followed by reduction of the resulting nitrobenzene methyl sulphone, or by methylating the corresponding nitrothio-phenols, oxidising the resulting methylthio-ether to a methyl sulphone group followed by reduction of the nitro group to NH_2. Some may be made by the method of *BP* 507,378 (cf. J.S.D.C., **55**, 514 (1939)). Thus 4-methylsulphonylaniline is diazotised and coupled with I, to give—



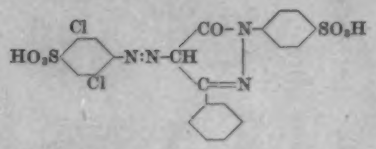
which dyes acetate rayon and nylon scarlet. E.S.

Yellow, Monoazo Pyrazolone Dyes for Hand-colouring Photographic Relief Images
Kodak Ltd. *BP* 758,969

Monoazo dyes



(R^1 = a chlorinated sulphophenyl radical; R^2 = a sulphoaryl radical; R^3 = a hydrocarbon radical or a water-soluble salt thereof) are bright yellows of good light fastness, stable in polyethylene glycol soln., and suitable for hand colouring photographic relief images. Thus, phenylhydrazine-*p*-sulphonic acid is condensed with ethyl benzoylacetate to give 3-phenyl-1-*p*-sulphophenyl-5-pyrazolone, which is coupled with diazotised 2:5-dichlorosulphanilic acid to give



E.S.

Metal(Chromium and Cobalt)-complex Monoazo Dyes for Wool, Nylon, etc.

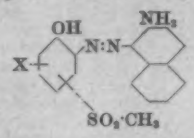
Gy *BP* 756,874

The metal complexes from 1 atom of Co or Cr and 2 mol. of the monoazo compound (I) 2-amino-4-nitro-phenol → 3:4-dimethylphenol, or with 1 mol. of I and 1 mol. of a similar *ao'*-dihydroxymonoazo compound free of acid, water-solubilising groups, dye wool, nylon, etc., yellow-brown to violet-brown from neutral or weakly acid baths. Thus a mixture of equimolecular proportions of the monoazo dyes I and 2-aminophenol-4-methylsulphone → *β*-naphthol is boiled with aq. ammonium chromosalicylate in presence of sulphonated castor oil. The mixed complex so produced dyes wool violet-brown. E.S.

Metal(Cobalt)-complex Monoazo Dyes for Wool, Nylon, etc.

Ciba *BP* 757,485

The cobalt complexes of monoazo dyes

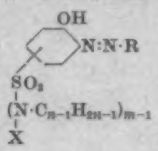


(X = H or Cl) dye wool, nylon, etc., from neutral or weakly acid baths. They are prepared by coupling a diazotised *o*-aminophenolmethylsulphone with *β*-naphthylamine or 2-naphthylamine-1-sulphonic acid and heating the monoazo compound so formed with Co salts. Thus the monoazo compound 2-aminophenol-4-methylsulphone → *β* naphthylamine is dissolved in aq. NaOH and heated at 80–85°c. with $CoSO_4$. The Co complex so formed dyes wool grey. E.S.

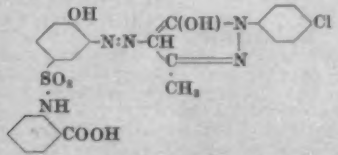
Metal(Chromium and Cobalt)-complex Monoazo Dyes for Wool, Nylon, etc.

Ciba *BP* 758,637

Metal complexes containing 1 atom of Cr or Co to 2 mol. of monoazo dyes, free of SO_3H groups and containing a COOH group not in the *ortho* position to a NH_2 or OH group, at least one of which is of the type



(R = radical of an *ortho*-coupling naphthylamine (or hydroxy compound) free of COOH or SO_3H groups; n = integer < 8; m = 1 or 2; X = aryl containing a COOH group) dye wool, nylon, etc. from neutral or weakly acid baths. Thus 2-aminophenol-4-sulphon-*o*-carboxyanilide is diazotised and coupled with 1-*p*-chlorophenyl-3-methyl-5-pyrazolone to give

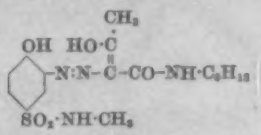


Boiling with a chromium sodium salicylate gives the chromium complex, which dyes wool orange. E.S.

Yellow, Metal(Cobalt)-complex Monoazo Dyes for Wool, Nylon, etc.

S *BP* 758,767

Monoazo compounds obtained by coupling a diazotised *o*-aminophenol, having a sulphamyl or alkylsulphone group as substituent, with a monoalkylamide of an acylacetic acid, Acyl·CH_2·CO·NHAlk (Alk has 6–18 C), are converted into 1:2 cobalt complexes. The products are greener yellow, and exhaust better from neutral baths, than the similar dyes of *BP* 716,753 in which dialkylamides of acylacetic acid are used as coupling components. Thus, diazotised 2-aminophenol-4-sulphonmethylamide is coupled with an emulsion of *N*-hexylacetoacetamide in aq. NaOH and Na_2CO_3 to give

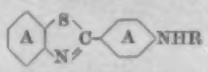


The cobalt complex is formed by stirring with aq. cobalt sodium tartrate at 25°c. E.S.

Metallisable Monoazo Direct Dyes of the Benzothiazole Series

ICI *BP* 757,727

Dyes for cellulose and nylon, which may be converted into copper complexes in substance or on the fibre, are made by diazotising an amine



(the nuclei A may contain substituents, e.g. CH_3 or SO_3H; R = H or -CO·Aryl·NH_2) and coupling with coupling components capable of metal-complex formation, e.g. 8-hydroxyquinoline (I), 4-hydroxyacridine, 4-hydroxybenzthiazoles, etc. Thus sodium 6-methyl-2-*p*-aminophenylbenzthiazole sulphonate is diazotised and coupled with I under alkaline conditions. The monoazo compound so formed dyes cotton brown, converted to orange red on after-coppering. E.S.

Metal (Chromium) - complex Dyes — Improved Method of Chroming

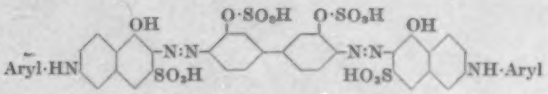
FBy *BP* 758,016

Mixtures of chromates with reducing carbohydrates (glucose, lactose, soluble starch, etc.) are powerful chroming solns. for the manufacture of chromium-complex dyes. Thus the monoazo compound 2-aminophenol-4-sulphonamide→3-methyl-1-phenyl-5-pyrazolone dissolved in dil. aq. NaOH is treated for 10 min. at 100°c. with a soln. of $K_2Cr_2O_7$ and glucose. The metal complex is isolated by adding acetic acid to give pH 8·5, and salting out. It dyes wool reddish orange from a weakly acid bath. E.S.

Blue Disazo Direct Dyes for Aftercoppering

Ciba *BP* 758,087

Disazo dyes



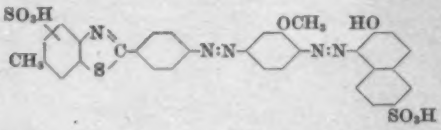
may be converted into copper complexes in substance, or preferably by after-coppering on cellulose, to give fast blues. Thus 3:3'-dihydroxybenzidine is treated with chlorsulphonic acid in chloroform to give the disulphuric acid ester, which is tetrazotised and coupled with *N*-phenyl-J acid in presence of slaked lime. The product dyes cotton greenish blue by the single bath or 2-bath after-coppering process. E.S.

Grey and Green Metal(Copper)-complex Disazo Direct Dyes

Ciba *BP* 756,599

Diazotised sulphonic acids of dehydrothio-*p*-toluidine or its substitution products are coupled with an *o*-alkoxyaniline or -naphthylamine in the *para* position to the NH_2 group. The resulting aminoazo compounds are diazotised and coupled with suitable *ortho*-coupling naphthols or naphtholsulphonic acids, and the *o*-alkoxy-*o'*-hydroxydisazo dyes so formed converted into copper complexes, which dye cellulose fibres green or grey. Thus dehydrothio-*p*-toluidine is monosulphonated with oleum, and the product is diazotised and coupled under weakly acid conditions with the *ω*-methanesulphonic acid of

o-anisidine. The ω-methanesulphonic acid group is removed from the monoazo dye so formed by hydrolysis with hot 4% aq. NaOH, and the resulting aminoazo compound diazotised and coupled with Schaeffer's acid, giving

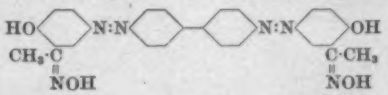


By heating it with ammoniacal $CuSO_4$ in presence of monoethanolamine the copper-complex is formed. It dyes cellulose fibres violet grey. E.S.

Metallisable Direct Azo Dyes having Ketoxime or Aldoxime Groups

FBy *BP* 757,541

Azo dyes having a ketoxime or aldoxime group in *ortho* position to an OH group are capable of metal-complex formation in substance, in the dyebath or on the fibre. Presence of this grouping also makes the metal-free dye more soluble. Thus tetrazotised benzidine is coupled with an alkaline soln. of *o*-hydroxy-acetophenone oxime to give



which dyes cotton reddish yellow by the after-coppering method. E.S.

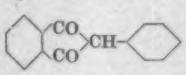
Formazan Dyes

Société Carbochimique *BP* 758,662

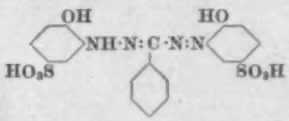
Triarylformazan dyes

$R^1{\cdot}NH{\cdot}N{:}C(R^3){\cdot}N{:}N{\cdot}R^2$

(R^1, R^2 and R^3 = aryl radicals) are made by coupling compounds $X{\cdot}CH(R^3){\cdot}Y$ (X and Y = CN or COZ; Z = OH, NH_2, H, Alk, Aryl, OAlk, or esterified COOH) with diazonium salts derived from $R^1{\cdot}NH_2$ and $R^2{\cdot}NH_2$, in two stages, if necessary, with hydrolysis of COZ after the first coupling. X and Y may form part of a cyclic system, as in 2-phenylindane-1:3-dione—



If R^1 and R^2 are derived from *o*-hydroxyamines the dyes produced are capable of metal-complex formation in substance or on the fibre. Thus α-phenylacetoacetic acid dissolved in aq. NaOH is coupled with 2 mol. of diazotised 2-aminophenol-4-sulphonic acid to give

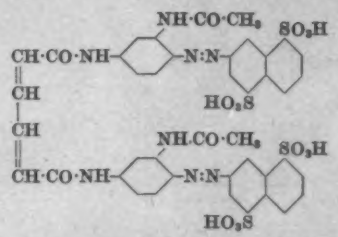


which dyes wool blue by a process of coppering on the fibre. E.S.

Dis- and Poly-azo Direct Dyes

S *BP* 757,927

Direct dyes are made by condensing 2 mol. of aminoazo compounds with 1 mol. of a butadiene-1:4-dicarboxylic halide or a halogen or alkyl derivative thereof. Alternative synthesis of the same dyes are described, e.g. 2 mol. of nitroamines or of aminoacylamines are condensed with 1 mol. of the acid halide, followed by reduction of the nitro groups, or hydrolysis of the acylamino groups, tetrazotisation of the resulting diamino compound, and coupling. Thus the aminoazo compound 2-naphthylamine-4:8-disulphonic acid → *m*-aminoacetanilide, dissolved in aq. NaOH, is treated with a soln. in benzene of butadiene-1:4-dicarboxylic acid chloride, running in 10% aq. Na_2CO_3 meanwhile to maintain a weakly alkaline reaction, to give

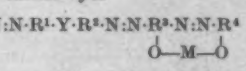


which dyes cellulose fibres dischargeable yellow. E.S.

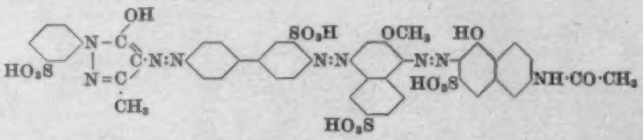
Metal(Copper and Nickel)-complex Trisazo Direct Dyes

Ciba *BP* 757,047

Metal-complex trisazo dyes



(Py = a pyrazolone residue; R^1 and R^2 = *p*-phenylene radicals; Y = CH:CH or a direct link; R^3 = benzene or naphthalene residue bound in *para*-position to the azo links; R^4 = an *ortho*-coupling naphthol, especially one containing an arylamino or acylamino group and an SO_3H group; M = Ni or preferably Cu) give greys to olive greens on cellulose, of good fastness to crease-resist finishing processes. Thus benzidine-3-sulphonic acid is tetrazotised and coupled, first under acid conditions with 3-methyl-1-*m*-sulphophenyl-5-pyrazolone, then under alkaline conditions with 2-methoxy-1-naphthylamine-6-sulphonic acid. The resulting aminodisazo compound is diazotised and coupled with *N*-acetyl-J acid in presence of Na_2CO_3 and pyridine, to give

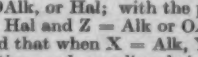


Boiling with aq. $CuSO_4$ gives the copper-complex which dyes cotton olive. E.S.

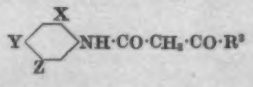
Yellow Azoic Dyes for Cellulose Acetate and Nylon

FH *BP* 757,079

Yellow azoic dyes fast to cross-dyeing similar to those of *BP* 737,270 (J.S.D.C., 71, 270 (1955)) are made on cellulose acetate and nylon by applying an amine



(R^1 and R^2 = aryl, aralkyl or *cyclo*alkyl, or R^1R^2N = radical of piperidine; the benzene ring *a* may contain Hal, Alk, OAlk, or OAryl) and a coupling component

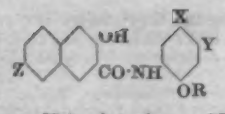


(R^3 = Alk or phenyl; X = Alk or OAlk; Y = OAlk or Hal; Z = Alk, OAlk, or Hal; with the proviso that when X = OAlk, Y = Hal and Z = Alk or OAlk, or Y = OAlk and Z = Hal, and that when X = Alk, Y = Hal and Z = OAlk), diazotisation and coupling being brought about by treating the fibre in a nitrous acid bath. Thus the Na salt of *N*-acetoacetyl-4-chloro-2:5-dimethoxyaniline and 2:5-dimethoxyaniline-4-sulphonpiperidide are applied together to cellulose acetate at 75°C. Treatment in a nitrous acid bath then develops the greenish yellow azoic dye E.S.

Red Azoic Dyes and Pigments

FH *BP* 756,843

Very bright pinks and reds of good light fastness even in pale dyeings are produced by coupling a diazotised 3-amino-4-alkoxybenzamide on the fibre with an arylide of 3:2-hydroxynaphthoic acid—



(of X and Y one = Hal; the other = OR; R = CH_3 or C_2H_5; Z = H, Hal, or OAlk). Or the dyes may be prepared in substance for use as pigments. Thus cotton yarn is impregnated with a soln. in aq. NaOH of 3:2-hydroxynaphtho-5′-chloro-2′:4′-dimethoxyanilide, centrifuged, and developed in a bath containing diazotised 3-amino-4-methoxybenzamide, to give a vivid bluish red. E.S.

Azoic Dyes for Cellulose Acetate and Nylon
FH *BP* 757,545

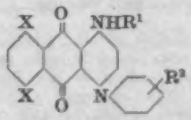
The diazoamino compounds formed by combining diazotised 2-aminoanisole-5-sulphodiethyl(or dimethyl)-amide with a hydroxydialkylamine having an alkyl group of 1–4 C (e.g. diethanolamine) are applied to cellulose acetate or nylon along with suitable coupling components to produce azoic dyeings and prints. Thus the diazoamino compound from diazotised 2-aminoanisole-5-sulphondiethylamide and diethanolamine is mixed with 3-hydroxy-2-naphtho-2′:4′-dimethoxyanilide and the thickened mixture printed on cellulose acetate or nylon. Steaming, followed by treatment in a bath of dil. H_2SO_4, develops a red print. E.S.

1-Amino-4-hydroxyanthraquinonesulphonic Acids—Intermediates and Acid Dyes
S *BP* 754,902

1-Amino-4-hydroxyanthraquinone derivatives carrying SO_3H at 2 and at 5, 6, 7 or 8, and/or possibly Hal at 2 and/or 6 or 7, are made by heating the corresponding 1-amino-4-bromoanthraquinone sulphonic acids with H_2SO_4 and H_3BO_3. Thus, 1-amino-4-bromoanthraquinone-2:6-disulphonic acid is heated at 120°C. for 6–10 hr. with 27% oleum, H_2SO_4 and H_3BO_3. The products are intermediates, acid dyes and are suitable for dyeing polyacrylonitrile fibres by the cuprous ion method. R.K.F.

***N*-Substituted 1:4-Diaminoanthraquinone Derivatives— Disperse Dyes for Cellulose Acetate and Nylon**
FBy *BP* 758,462

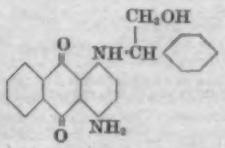
Dyes of formula—



(R^1 = H or Alk, or, when dyeing nylon only, *cyclo*alkyl or hydroxy*cyclo*alkyl; R^2 = OH, NH_2, NHalkyl, N-(Alk)$_2$ or O-alkyl or, when dyeing nylon only, NHCO-alkyl; X = H or OH) have good affinity for cellulose acetate and nylon when used as disperse dyes. Thus 1-amino-4-methoxyanthraquinone heated at 130°C. with *p*-amino*cyclo*hexylamine until the colour change is complete yields fine crystals of 1-amino-4-(*p*-amino*cyclo*hexylamino)-anthraquinone, on addition of water. This product is soluble in dilute acetic acid and dyes nylon a violet-blue of good fastness. C.O.C.

β-Hydroxy-α-phenylethylaminoanthraquinones— Disperse Dyes
Deutsche Gold- und Silber-Scheideanstalt *BP* 756,261

An aminoanthraquinone is treated with styrene oxide or one of its alkylated derivatives to produce disperse dyes. Thus 1:4-diaminoanthraquinone is heated at 90°C. for 3 hr. with styrene oxide in xylene containing acetic acid to give—



which dyes cellulose acetate blue-violet. R.K.F.

Arylaminoanthrapyrimidinepolysulphonic Acids— Acid Dyes
ICI *BP* 755,960

2-Aryl-6-arylamino-1′:9′-anthrapyrimidines are sulphated to introduce $\leqslant 2$ SO_3H's to give bright red acid dyes. Thus 6-*p*-*n*-butylanilino-2-*p*-phenylphenyl-1′:9′-anthrapyrimidine (obtained by condensing *p*-*n*-butylaniline with the 6-chloro- or 6-bromo-anthrapyrimidine derivative) is stirred at 35°C. with ca. 8% oleum until a test sample is soluble in water at 35°C. The product is separated by pouring into ice and water. R.K.F.

Crystal Violet
General Aniline *BP* 758,561

An aqueous dispersion of Crystal Violet is atmospheric drum dried to a moisture content of $\geqslant 2\%$. Drying is so rapid that the crystals have not time to change form. The product is so dry that it can be used to produce very low viscosity compositions, particularly hectograph inks. C.O.C.

Titanium Dioxide Pigments
DuP *BP* 758,409

Pigment quality rutile is obtained by treating $TiCl_4$ vapour preheated to $\geqslant$ 400°C. with 0·1–2·0% on its weight of air having a moisture content of 0·05–10·0% by volume. The reaction temperature is 800–1400°C. The product, which contains a little Al_2O_3, is then given a normal pigment finishing treatment. C.O.C.

Coated Titanium Dioxide Pigment for Use in Lithographic Inks
American Cyanamid Co. *USP* 2,721,853

TiO_2 is slurried with an aqueous dispersion of a mixture or precondensate of a methylated methylol melamine and a fatty acid amide, dried and baked to cure the resin. The product is water-repellent in presence of lithographic ink and fountain solution for prolonged periods and so permits formation of lithographic inks of adequate stability to fountain solutions. C.O.C.

Mechanism of Polymerisation of Ethylene Oxide on Phenol (III p. 591)
Dermatitis from Nylon Stocking Dyes (VIII p. 612)
Disperse Dyeing of Polyesters of Aromatic Dicarboxylic Acids (VIII p. 612)
New Indicator for Titration of Calcium with an (Ethylenedinitrilo)tetra-acetate (XIV p. 619)
Pyrocatechol Violet: Indicator for Chelatometric Titrations (XIV p. 619)
New Complexing Agents. II — Pararosanilinehexa-acetic Acid (*NNN′N′N″N″*-Hexakiscarboxymethyl-pararosaniline) (XIV p. 620)

V—PAINTS; ENAMELS; INKS

Surface Coatings— Present Position and Development during the Last 25 years in the U.S.A.
J. E. Sayre
Chem. Eng. News, **34**, 3746–3749 (6 Aug. 1956)

A review of the present position in the paint and lacquer industry in the U.S.A. and of the developments during the last quarter of a century. Pigments and colours, both by weight and value, are the largest single component used by the makers of surface coatings in 1955, approx. 2100 million lb. of them being used. The most important of them are TiO_2 and various forms of Pb and Zn. The rapid strides made possible by the remarkable hiding properties of TiO_2 have been one of the main features of modern paint technology. Many new pigments are coming to be used including the phthalocyanine blues and greens. While at one time white paints formed over half the production, coloured paints are increasing in popularity, the order of preference of them now being: yellow, red, orange, green, blue, black, brown and purple, in that order. A few years ago black would have been higher up. The use of coatings in the U.S.A. was 1·7 gal. per head of population in 1931, 2·4 in 1940, 3·9 in 1950 and 3·8 in 1955. C.O.C.

Critical Pigment Volume Concentration of Emulsion Binders
J. C. Becker and D. D. Howell
Off. Dig. Fed. Paint Varn. Prod. Clubs, **28**, 775–793 (Sept. 1956)

Five homopolymers and three copolymers of polyvinyl acetate, an acrylic, and a butadiene–styrene emulsion

were pigmented to 30–65% pigment volume concn., and free films were tested for tensile strength and elongation. The critical pigment volume concn. (CPVC) obtained by this method show a distinct relationship to the particle size of the emulsion; they correlate also with stain removal, scrubability, durability on exterior exposure (as measured by the Weather-Ometer), and enamel hold-out (the pigment volume concn. at which there is a sudden decrease in film gloss). Tensile strength determinations afford the best means for measuring CPVC (giving the best correlation), but a good estimate should be obtainable from a knowledge of the emulsion particle size. J.W.D.

Intumescent Fire-retarding Paint with a Protein Base. I— Pyrolysis Curves of Proteins and their Hydrolysates; Pyrolysis Curve of Monosodium Glutamate (VI p. 607)

VI— FIBRES; YARNS; FABRICS

Table of Fibre Data

A. Wilhelm

Textil Praxis, **11**, 1036 (Oct. 1956)

Variation of Fineness within Samples of Various Staple Fibres

D. H. Morton

J. Textile Inst., **47**, T 422–T 429 (Aug. 1956)

Variation in fineness within samples of 18 natural and man-made staple fibres is studied, using a vibroscope (briefly described) to measure fineness of individual fibres. Natural and regenerated protein fibres have in general a broader distribution of fineness than cellulosic and synthetic fibres. Most distributions have a strong positive skew, though cellulose acetate fibres have a negative skew. Where variability of fineness is high, a considerable improvement in accuracy or a saving of labour can be effected by measuring individual fineness when single-fibre tests, such as breaking load, are carried out. J.W.B.

Developments in Methods of Carpet Manufacture

G. B. Angus

J. Textile Inst., **47**, P 670–P 684 (Aug. 1956)

Advances in the manufacture of the traditional carpet, and, more briefly, of needleloom and tufted carpeting, are surveyed. Descriptions are included of problems associated with soiling, bleaching, oiling, dyeing, twist-setting for non-crush types, and finishing. J.W.B.

Growing Process of the Cellulose Fibre

Y. Ono

III— Change in the Composition of Cellulose and Non-cellulosic Materials during the Growing Process of Cotton Fibre

J. Soc. Textile Cellulose Ind. Japan, **12**, 443–447 (July 1956)

Cellulose and non-cellulosic materials (total nitrogen, phosphorus, ash, etc.) were measured daily in order to make clear the changes in chemical composition of lint during the growing process of the cotton fibre— (1) The absolute weight of cellulose in lint increases linearly from the day on which the growth of wall thickness just begins, until the day on which boll opening just begins, and it is shown that cellulose is synthesised and deposited in lint at the same rate during this period. (2) The absolute weight of non-cellulosic materials shows a maximum during the period of the growth of lint elongation, rapidly decreases during the early period of the growth of wall thickness, and later shows a constant value; these non-cellulosic materials may take part in cellulose formation after the start of the growth of wall thickness, and finally deposit inside the wall of the lumen.

IV— Content of Wax in Lint during the Growing Process of Cotton Fibre

Ibid., 540–542 (Aug. 1956)

The weight % and the absolute weight of wax in lint were measured daily during the growing process of cotton. It is concluded that the wax is a surface constituent of the cotton fibre and exists only in the primary wall; it cannot be found in any appreciable amount in the inner structure, i.e. the secondary wall of the cotton fibre.

AUTHOR

Factors affecting the Wettability of Cotton Fibres

N. M. Sokolova, P. P. Viktorov, and F. I. Sadov

Nauch.-Issledovatel. Trudy Moskov. Tekstil. Inst., **13**, 43–60 (1954): *Referat. Zhur., Khim.*, 1955, No. 2869: *Chem. Abs.*, **50**, 11674 (25 Aug. 1956)

Removal of waxy and pectinous substances from the fibres and crushing the primary wall of the fibre did not materially affect the thermal stability of wetting the fibre. This primarily depended on increasing on the accessible surfaces of the fibres the number of free OH groups in which the strength of the H bond in subsequent drying is low. Another influential factor was making denser the structure of the fibre, which led to reducing the mobility of macromolecules. This resulted in great increase of the stability of the system and particularly in great thermal stability of wetting. This was confirmed by infrared absorption spectra of cotton fibres before and after treatment with alkali. C.O.C.

Physical Properties of Chemically Modified Cottons

I— Properties of the Untreated Cottons

A. W. McDonald, G. C. Humphreys, O. M. Kromhout, and J. N. Grant

Text. Research J., **26**, 641–646 (Aug. 1956)

The effects of the following chemical treatments on the physical properties of six varieties of cotton have been studied— acetylation, mercerisation, amination, carboxymethylation, and decrystallisation. This report, the first of a series, provides an introduction to the work, and contains data on the physical properties of yarns and fibres of the untreated control samples.

II— Effects of Partial Acetylation

A. W. McDonald, G. C. Humphreys, R. S. Orr, and J. N. Grant

Ibid., 646–652

Yarns manufactured from the six varieties of cotton were partially acetylated, whilst under tension, to an acetyl content of approx. 24%. Breaking loads and tenacities of the fibres were decreased, whilst their linear densities and secant moduli were increased. Breaking loads, linear densities, and secant moduli of the yarns were increased. Elongation of the yarns at break was decreased, whilst tenacities were essentially unchanged. The changes in most properties were found to be associated with differences in the cottons and in the acetyl contents. J.C.F.

Preparation of Low-alkali Viscoses

W. Matthaes

Faserforsch. und Textiltech., **7**, 420–422 (Sept. 1956)

Readily soluble xanthates, soluble in water without addition of lye and leading to low-alkali viscoses, are obtained when the alkali cellulose is diluted with water shortly after addition of CS_2. Alkali celluloses with a cellulose content of 20% and less give readily soluble xanthates on treatment with sulphide. Addition of emulsifying agents and use of a CS_2–lye emulsion to avoid squeezing out of lye is not advantageous in the manufacture of viscose. W.R.M.

Fibre Production from Viscose prepared from Cellulose Xanthates of Low Degree of Substitution

Z. A. Rogovin, N. V. Shulyatikova, and L. A. Gorodetskaya

Tekstil. prom., **16**, 18–22 (July 1956)

Practical conditions for fibre production from cellulose xanthates of low degree of substitution are investigated (cf. J.S.D.C., **72**, 396 (Aug.), 455 (Sept. 1956)). The most efficient utilisation of the reduced amount of CS_2 is ensured by more complete expression of lye from the alkali-cellulose, and adequate solubility of the xanthate is attained by the use of a low dissolution temp. The effect of the composition of the spinning bath on the fibre properties is studied. A.E.S.

Application of Ultramicrotomy to the Study of the Fine Structure of Viscose Rayon Fibres

P. Kassenbeck

Bull. Inst. Text. France, (61), 7–15 (June 1956)

A new technique for cutting sections of viscose rayon fibres down to a thickness of 200A. is described. Examination of such sections in the electron microscope indicates a concentric-layer structure in the skin due to periodicity in the coagulation process. The packing density is highest in the cuticle. Sections cut by this method show some fine-structure details when examined by phase-contrast microscopy. J.C.F.

Effects of Temperature on Wet Viscose Rayon
I— Water Imbibition and Swelling
J. F. Clark and J. M. Preston
J. Textile Inst., **47**, T 413–T 416 (Aug. 1956)

The swelling of viscose rayon and cotton, as measured by water imbibition, is determined over a range of temperatures. The minimum swelling occurs in the region of 50–60°C. Results are also given for the irreversible change in the water imbibition of viscose rayon which occurs when these fibres are heated in water for short periods.

II— Tensile Properties
J. F. Clark, J. M. Preston, and B. C. Shroff
Ibid., T 417–T 418

Load–extension curves for completely wet viscose rayon are measured at temperatures between 0° and 100°C., and the effect of temp. between 15° and 100°C. on the relaxation of stress with time in stretched viscose rayon immersed in water is also studied. At about 55°C. the properties change markedly: breaking load decreases sharply, extension at break is a maximum, and the rate of stress relaxation increases sharply.

III— Discussion
J. F. Clark and J. M. Preston
Ibid., T 419–T 421

Phenomena described in I and II are explained on the assumption that above 50°C. there is a rapid rise in the rate of dissociation of cellulose–cellulose cross-bonds.
J.W.B.

Yellowing Tendency of Viscose Rayon degraded by Oxidation
J. Pinte and P. Rochas
Bull. Inst. Text. France, (61), 27–36 (June 1956)

The yellowing on long-term storage of viscose rayon samples treated by oxidative procedures designed to produce various types of functional groups has been investigated. Yellowing is found to be associated with the presence of aldehyde and ketonic groups in the 2 and 3 positions of the β-glucopyranose units. It is shown that treatment with sodium chlorite can improve the permanence of whiteness in accidentally modified fabrics, and that chlorite bleaching always gives a permanent white.
J.C.F.

New Cellulosic Fibres and their Relation to the Chemical Industry
S. B. McFarlane
Canadian Textile J., **73**, 51–55 (10 Aug. 1956)

In this summary of the properties of Arnel (triacetate rayon) and Fortisan–36 attention is focussed on the effects of heat-treating the former. Higher m.p., lower moisture regain, increased drying rate, and lower swelling and shrinking are advantages obtained in addition to improved dimensional stability, wash fastness, and resistance to gas fading and better dye penetration. The excellent tensile properties and dimensional stability of Fortisan–36 make it particularly suitable for mechanical V belts and for military use as body-armour fabrics.
A.H.

Relation between the Softness of Handle of Wool in the Greasy and Scoured States and its Physical Characteristics.
N. F. Roberts
Text. Research J., **26**, 687–697 (Sept. 1956)

A study of the relation of the physical characteristics of wool samples to the appraisal of handle by buyers is described. Of the properties studied, mean fibre diameter and degree of crimp appear to be most important in determining handle. For greasy samples, increasing amounts of suint tend to give a harsher handle.
J.C.F.

Distribution of Ortho- and Para-cortical Cells in Wool and Mohair
R. D. B. Fraser and T. P. Macrae
Text. Research J., **26**, 618–619 (Aug. 1956)

Radial differentiation of ortho- and para-cortical cells, previously demonstrated in Lincoln wool by staining with basic dyes, is present also in a mutant merino fleece with no crimp, and in mohair. It is suggested that this may be a not uncommon structural feature of wool and allied fibres with little or no crimp.
J.C.F.

Effect of Electrolytes on the Rate of Supercontraction of Wool
W. G. Crewther and L. M. Dowling
Nature, **178**, 544–545 (8 Sept. 1956)

Wool fibres were immersed in salt solutions buffered at pH 6·5–7 at 100°C. for 1 hr., and changes in length were measured. Cations used were K^+, Na^+, Li^+, Ca^{2+}, Sr^{2+}, and Ba^{2+}; anions were acetate, chloride, bromide, iodide, thiocyanate, trichloroacetate, and benzoate. Free halogen in halide solutions inhibited supercontraction. On arranging the salts of a particular cation according to the concentration required to cause a certain degree of supercontraction the anions occurred in the order of the lyotropic series. With Li salts the approx. concn. required to give 25% supercontraction were— acetate 12M., chloride 8·5M., bromide 4·5M., iodide 3M. With a series of iodides the concn. required were— K^+ 6M., Na^+ 5M., Li^+ 3M., Sr^{2+} 3·5M., Ca^{2+} 2M. It is suggested that, if the tendency for ions to be absorbed on the wool proteins varies in a similar way to their tendency to be absorbed by non-protein materials, small highly hydrated ions are absorbed less readily. The effective charge of a negatively charged protein would tend to increase in the presence of high concn. of a salt of a readily absorbed anion and a cation which is not readily absorbed. Any marked increase in molecular charge would impose stresses on intra- and inter-molecular bonds, resulting in disaggregation and disordering of the wool proteins.
W.R.M.

Intumescent Fire-retarding Paint with a Protein Base. I— Pyrolysis Curves of Proteins and their Hydrolysates; Pyrolysis Curve of Monosodium Glutamate
N. Shikazono and T. Kanayama
Rept. Govt. Chem. Indust. Research Inst. Tokyo, **51**, 275–285 (July 1956)

For the purpose of utilising proteins for fire-retarding paints of the intumescent type, temperature–weight decrease curves obtained for proteins, partial hydrolysates, and amino acids by means of a thermobalance, the temperature being raised at a rate of 50°C. in 5 min., were compared. Eighteen kinds of protein and protein-containing material, such as casein, gelatin, silk, defatted soyabean flour, etc., were examined. The curves obtained seemed to be of similar type; i.e. at first moisture was given off, and thereafter took place a steep weight decrease of different amount, particularly large for silk, followed by the second rapid step of the decrease, which seemed to be clearly discernible in the case of some linear proteins. Insoluble matter formed when casein was partially hydrolysed with superheated water showed a curve similar to that of untreated casein, while soluble matter simultaneously formed gave a somewhat different curve, in which a new steep decrease appeared at lower temperatures. This step of degradation was also observed with the soluble part of casein partially hydrolysed with 10% sulphuric acid. The amino groups formed by hydrolysis may be related to the appearance of the new step, because this step disappears when the soluble substance is treated with formalin. With amino acids degradation curves differed particularly in the proportion of the steep weight decrease. For instance, a large part ($> 80\%$) of the weight of leucine, alanine, cystine, and proline was lost within a small temperature range, whereas the steep weight decrease of arginine, histidine, and tyrosine was only $< 50\%$. The proteins and their hydrolysates employed were compared roughly by their swelling on heating, and were classified into three groups. The soluble matter in partial hydrolysates of casein, the apparent swelling volume of which was largest, melted and swelled to some extent during the period of the first steep degradation, but they violently swelled to the maximum during the entire course of the second steep degradation followed by carbonisation. The pyrolysis curve of monosodium glutamate is given as an appendix.
AUTHORS

Esters in Human-hair Fat
N. Nicolaides and R. C. Foster
J. Amer. Oil Chem. Soc., **33**, 404–409 (Sept. 1956)

A study was made of the hair-fat composition of human adults with special reference to its ester content. Waxes, triglycerides, and a mixture of mono- and di-glycerides were isolated and characterised. Indirect evidence is presented that the free acids of hair fat are derived from lipolysis of triglycerides. Some preferential esterification of some kinds of fatty acids as glycerides and others as waxes was observed. No significant differences could be observed in the analysis of the hair fat of adult males compared with that of adult females of the same age group.
P.G.M.

Utilisation of the Carboxyl Carbon of L-Phenylalanine for the Synthesis of the Amino Acids of Silk by *Bombyx mori*
S. Brieteux-Grégoire, W. G. Verly, and M. Florkin
Nature, **177**, 1237–1238 (30 June 1956)
The observation of Fukuda (*ibid.*, **177**, 429 (1956)) that *Bombyx mori* converts phenylalanine into the tyrosine of silk has been confirmed. Phenylalanine labelled with ^{14}C in the –COOH group was injected into silkworms after the feeding period. Analysis of the silk produced revealed the radioactivity in the carboxyl carbon of tyrosine and not in alanine as was anticipated. A.J.

Amino-acid Sequence in a Fraction of *Bombyx* Silk Fibroin
F. Lucas, J. T. B. Shaw, and S. G. Smith
Nature, **178**, 861 (20 Oct. 1956)
Evidence is submitted to show that the ppt. formed when an aq. soln. of the fibroin of *Bombyx mori* is acted upon by chymotrypsin (through the specific action of the enzyme on the α-carboxyl groups of the tyrosine residues), and consisting almost entirely of glycine, alanine, and serine, together with a little tyrosine, is composed of an aggregation of sections of the fibroin mol., these sections having the formula—
Gly·Ala·Gly·Ala·Gly·[Ser·Gly·[Ala·Gly]$_n$]$_2$·
Ser·Gly·Ala·Ala·Gly·Tyr
where n is usually 2, and always has a mean value of 2. H.H.H.

Configurations of Silk Fibroins and Synthetic Polypeptides
A. Elliott and B. R. Malcolm
Biochim. Biophys. Acta, **21**, 466–471 (Sept. 1956)
The infrared spectra of a number of different kinds of silk are compared with spectra of synthetic polypeptides prepared from L-alanine and glycine. It is shown that the molecular configuration depends on the composition of the material and on the solvent used for the preparation of the specimen. In the case of tussah silk, there is strong evidence for α-helices consisting mainly of L-alanine residues. The results are discussed in relation to the configuration of the molecules in solution. P.G.M.

Treatments that render Fibroin insoluble in Cuprietheylenediamine, and Sericin insoluble in Hot Soap Solution
C. J. Cadwallader and S. G. Smith
J. Textile Inst., **47**, T 489–T 496 (Sept. 1956)
Under certain conditions of treatment silk proteins are insolubilised by nitrous acid, formaldehyde, hypochlorite, and light. Impregnation with NaOH followed by heating will insolubilise fibroin but not sericin. It is suggested that nitrous acid leads to the formation of reactive nitroso and diazo groups on the tyrosine nucleus; these may easily form cross-links, but this can be prevented by including in the nitrous acid bath a chelating metal, which blocks the reactive groups. Formaldehyde-promoted insolubilisation is probably due to formation of methylene ether bridges by way of serine, threonine, and, possibly, tyrosine side-chains. Ultraviolet radiation may rupture the molecular chains, which then have a chance to reform with adjacent portions, thus forming a type of cross-bond. The resistance of these bonds to cuprietheylenediamine suggests that they are covalent. No explanation is offered for the action of NaOH and heat. Hypochlorite may react with silk proteins to produce aldehydes, which can participate in cross-link formation. J.W.B.

Action of Acids and Alkalis on Fibroin in presence of Salts of Organic Acids
M. V. Korchagin
Nauch.-Issledovatel. Trudy Moskov. Tekstil. Inst., **13**, 60–69 (1954): *Referat Zhur., Khim.*, 1955, No. 2872: *Chem. Abs.*, **50**, 11675 (25 Aug. 1956)
Acid hydrolysis of silk fibroin is greatly increased in presence of a number of organic sulphonates depending on their nature and concentration. Nekal BKh, merthiolate, sulfonol, Naphthol Orange, Chrysophenine and Direct Sky Blue are particularly effective; Igepon T and benzene- and naphthalene-sulphonates are somewhat less active. None of these compounds increases alkaline hydrolysis of fibroin. Non-ionic surface active compounds and some basic dyes, e.g. Methylene Blue, and electrolytes forming amphoteric ions (e.g. sulphanilic and naphthionic acids, and Methyl Orange) have no effect on the acid hydrolysis of fibroin. The experimental results are interpreted on the basis of the diffuse electron layer at the interphase. C.O.C.

Casein Fibres— Fibrolane, Lanital S, Merinova
P.-A. Koch
Z. ges. Textilind., **58**, 683–686 (5 Sept. 1956)
Tables of data with 81 references (second edition). C.J.W.H.

Relationship between the Chemical and the Man-made Fibre Industries
H. A. Thomas
Chem. and Ind., 852–857 (25 Aug. 1956)

Man-made Fibre Production and Energy Economy
A. Wilke
Faserforsch. und Textiltech., **7**, 457–463 (Oct. 1956)

Present Position in the Development of Synthetic Fibres— Advantages and Disadvantages in their Textile and Technical Application
H. M. Ulrich
Melliand Textilber., **37**, 184–187 (Feb. 1956)

Review of Developments in the Properties, Processing, and Utilisation of Man-made Fibres
H. Ashton and J. Boulton
J. Textile Inst., **47**, P 532–P 566 (Aug. 1956)
This comprehensive review covers the production, consumption, properties, and uses of man-made fibres; machinery for spinning, processing, knitting, and weaving; and dyeing and finishing. J.W.B.

Textured Filament Yarns
L. G. Ray
J. Textile Inst., **47**, P 567–P 581 (Aug. 1956)
Textured filament yarns are defined as normal multifilament yarns in which the individual fibres have been displaced from their natural parallel and relatively close-packed positions by some type of yarn treatment. Yarns considered are Agilon, Ban-Lon, Burmilized, Fluflon, Helanca, and Taslan. The variety of yarns available can be separated on the basis of properties into stretch yarns and form-stable yarns. Techniques for producing stretch yarns have been successfully applied to thermoplastic fibres such as nylon and Terylene, while the process of preparing form-stable yarns such as Taslan is applicable to all multifilament yarns regardless of fibre type. Methods of manufacture, yarn and fabric properties, preparation of fabrics, and dyeing and finishing are discussed. J.W.B.

Tubular Filaments and Fibres
O. E. Bruck
Canadian Textile J., **73**, 83–89 (24 Aug. 1956)
A description of various methods that have been employed in attempts to produce air-filled filaments. The desirable characteristics of such fibres, particularly buoyancy and thermal properties, are discussed. A.H.

Action of Oil on Rubber Threads
H. Reumuth and H. Dräger
Textil Praxis, **11**, 811–813 (Aug. 1956)
A number of cases are described dealing with faults in knitted and woven goods made of synthetic fibres, such as half-hose, corsets, etc., which contain rubber threads. The faults have been incorrectly attributed to a cutting action of the synthetic fibre, but are really due to the action of oil. This effect is especially marked when the goods have been subjected to a dry heat treatment. B.K.

Effect of Crystallinity on the Properties of Nylons
H. W. Starkweather, G. E. Moore, J. E. Hansen, T. M. Roder, and R. E. Brooks
J. Polymer Sci., **21**, 189–204 (Aug. 1956)
Increasing the degree of crystallisation of unoriented 6,6- or 6,10-nylon increases the stiffness, yield point, tensile strength, and hardness but reduces impact strength. Impact strength is increased by increasing molecular weight, but other properties are substantially unchanged. The effects of varying water contents are independent of varying crystallinity and are generally in the opposite direction. W.R.M.

Effect of Drawing on the Infrared Dichroism of 6,6-Nylon Filaments
G. Caroti and J. H. Dusenbury
Nature, **178**, 162–163 (21 July 1956)
The method of specimen preparation is shown to affect the infrared dichroism of nylon filaments, the effects being

diminished with increasing draw ratio of the filaments. Parallel dichroism is induced by mechanical flattening of the filaments and, to a lesser extent, by microtoming perpendicular to the filament axis. Perpendicular dichroism is induced by microtoming along the axis. A.J.

Developments in 6,6- and 6,10-Nylon Fibres
H. C. H. Tallis
J. Textile Inst., **47**, P 582–P 597 (Aug. 1956)

A number of nylon fibres, not produced in this country commercially, are studied, comprising black mass-coloured 6,6 yarn, 6,6 yarn of increased acid dye uptake, 6,6 yarns composed of filaments of triangular and elliptical cross-sections, and 6,10-nylon yarn. Descriptions of methods of preparation and properties are given. Difficulties of producing mass-coloured black fibre are associated with the dispersion of carbon black in the polymer. Fibre properties may be affected by other substances added adventitiously with the carbon. The equilibrium uptake of acid dyes by 6,6-nylon can be increased if the mol.wt. of the polymer is stabilised by blocking the ends with a base rather than an acid stabiliser. Changes in filament cross-section can alter the drape and appearance of fabrics. The effects of finishing on the handle of fabrics made from fibres of different cross-section are also noted. Fabrics of 6,10-nylon appear to have more rapid recovery from creasing. J.W.B.

Depolymerisation of Polycaprolactam by Alkali-metal Carbonates—II
O. Wichterle, J. Králíček, J. Šebenda, and A. Chalupná
Faserforsch. und Textiltech., **7**, 393–397 (Sept. 1956)

The influence of various conditions on the rate of the depolymerisation of polycaprolactam catalysed by alkali-metal carbonate and on the quality of the caprolactam obtained are examined. Higher concentration and finer distribution of catalyst and low pressure increase the rate of reaction and improve the quality of the caprolactam. The rate of depolymerisation increases with increase of temperature, but the quality of the caprolactam suffers. W.R.M.

Some Isomorphous Copolyamides
F. B. Cramer and R. G. Beaman
J. Polymer Sci., **21**, 237–250 (Aug. 1956)

Various copolyamides obtained from heptamethylenediamine (7) and bis-3-aminopropyl ether (303) combined with adipic acid (6) and terephthalic acid (T) were prepared and characterised as bulk polymer, films, and melt-spun drawn monofils. The system 303–6/7–6 is isomorphous, as shown by a linear dependence of all physical properties on composition. Other systems show deviations from isomorphous behaviour. W.R.M.

Relationships between Chain Structure and Properties of Polyamides and Polyesters
V. V. Korshak
Faserforsch. und Textiltech., **7**, 423 (Sept. 1956)

Summary of paper given at Conference on Artificial Fibres, Moscow, 12th–21st April 1956. Properties such as melting point and alcohol solubility of polyamides and polyesters are discussed in terms of the number and type of atoms in the monomer units from which they are formed. W.R.M.

Polyester Fibres
P.-A. Koch
Z. ges. Textilind., **58**, 743–749 (5 Oct. 1956)

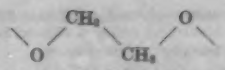
Tables of data with 115 references (second edition). C.J.W.H.

Determination of the Equilibrium Constants for the Formation of Polyethylene Terephthalate
W. Griehl and P.-F. Förster
Faserforsch. und Textiltech., **7**, 463–468 (Oct. 1956)

A process for the preparation of polyethylene terephthalate of prescribed D.P. is described. The method enables the equilibrium constant for the reaction to be found. W.R.M.

Rotational Isomerism in Polyethylene Terephthalate
I. M. Ward
Chem. and Ind., 905–906 (1 Sept. 1956)

It is suggested that the differences in X-ray photographs and infrared spectra of stretched and unstretched polyethylene terephthalate are due not to the presence of crystallinity in the stretched material but to configurational changes in the amorphous material. X-ray measurements show that the configuration of the—



groups is *trans*. It is postulated that an additional preferred configuration also occurs in amorphous regions. Infrared spectra can be explained in terms of the vibration of the two rotational isomers. Some experimental evidence in support of this view is given. W.R.M.

Pyrolysis. VII—Model Systems for the Pyrolysis of Poly(ethylene Terephthalate)—2:2′-Dibenzoyloxydiethyl Ether, 2-Benzoyloxyethyl Vinyl Ether, and certain related Vinyl Ethers
H. V. R. Iengar and P. D. Ritchie
J.C.S., 3563–3570 (Sept. 1956)

The following reaction sequence appears to explain the pyrolysis of 2:2′-dibenzoyloxydiethyl ether at 450–500°C.: *Stage 1*—Alkyl–oxygen scission at an ester group to give 2-benzoylethyl vinyl ether and benzoic acid. *Stage 2*—Secondary breakdown of the former cpd. by three competitive routes: (1) alkyl–oxygen scission at the ester group to give vinyl benzoate and acetaldehyde, (ii) disproportionation to ethylene dibenzoate and 1:2-divinyloxyethane, and (iii) alkyl–oxygen scission at the ester group to give benzoic acid and vinyl ether. *Stage 3*—A series of tertiary breakdowns of the primary and secondary products. These conclusions are supported by the pyrolysis of divinyl, *n*-butyl vinyl, and *iso*butyl vinyl ethers. The bearing of the results on the pyrolysis of technical poly(ethylene terephthalate) is discussed. H.H.H.

Raising the Thermal Stability of Fibres derived from Chlorine-containing Vinyl Polymers
N. V. Mikhailov, L. G. Tokareva, and V. S. Klimenkov
Tekstil. prom., **16**, 26–28 (July 1956)

Fibres prepared by the soln. spinning of mixtures of 95 basal moles % of e.g. polyvinyl chloride (PVC) or chlorinated PVC and 5 basal moles % of e.g. cellulose diacetate or cyanoethyl(hydroxyethyl)cellulose are very much more stable to heat than the single-component chlorine-containing fibres. A.E.S.

Hibulk Acrilan
S. J. Davis
Amer. Dyestuff Rep., **45**, P 682–P 684 (10 Sept. 1956)

Acrilan fibres can be extended when heated, and then set by allowing to cool while still extended. This set is stable for prolonged periods at ordinary temperatures, but subsequent heat treatment, e.g. with boiling water, will relax the fibres to the original length. If a yarn is prepared from a mixture of set and unset fibres, it will bulk when so heated, owing to the unset fibres being puckered as the others relax. The production of such yarns, and the novelty effects obtainable therefrom, are discussed. J.W.B.

Polyvinyl Cyanoethyl Ether. I—Vapour-phase Preparation of Polyvinyl Cyanoethyl Ether
M. Negishi, I. Sekiguchi, and S. Okada
J. Soc. Textile Cellulose Ind. Japan, **12**, 479–486 (July 1956)

The synthesis of polyvinyl cyanoethyl ether by the reaction of polyvinyl alcohol (P.V.A.) with acrylonitrile vapour, in the presence of NaOH as catalyst, was studied, including the effects of preswelling by the catalyst (0–5 hr.), amount of water and catalyst (H_2O/P.V.A. = 0·1–2·5 by wt. and NaOH/P.V.A. (mol. ratio) = 0·01–0·34), time and temperature of the reaction (0·5–18 hr. and 25–55°C.), and pressure in the reaction vessel (5–760 mm. Hg) on the rate of cyanoethylation. At relatively high temperature and catalyst concentration, a very abnormal rate of cyanoethylation was observed. This may be due to the reverse reaction of decyanoethylation and the slight degree of hydrolysis of the cyano group. On the assumptions that the reactions of cyanoethylation, decyanoethylation, and hydrolysis are all of the first order and that the crystalline and the amorphous regions of P.V.A. have different velocity constants, a theoretical equation for the rate of cyanoethylation is derived. With a value of 60% for the accessibility of P.V.A., this equation shows a comparable trend to the experimental results. AUTHORS

PATENTS

Regenerated Cellulose Threads
Courtaulds *BP* 756,668

An improved method of treating high-tenacity rayon

threads with caustic alkali solution to improve their extensibility is described using a thread advancing reel or a pair of rollers having inclined axes. W.G.C.

Cellulose Triacetate Textiles having a Sticking Temperature of at least 220°C.
BrC *BP* 758,442

Materials made from cellulose triacetate of normal crystallinity have their "sticking" temperature raised from 200°C. to ≮ 220°C. by heating it in presence or absence of water or tension to below the softening point of cellulose triacetate. C.O.C.

Increasing the Affinity of Polyvinyl Alcohol Fibres for Acid, Direct, and Mordant Dyes
Kurashiki Rayon Kabushiki Kaisha *BP* 757,719

Polyvinyl alcohol fibres which have had their resistance to water increased by being heated, are treated with a compound of formula $H_2N{\cdot}R{\cdot}A$ (A = CHO or $CH(OAlk)_2$; R = Alk, Ar or alicyclic and contains at least 2 C and may contain an element other than C or H) until they contain 0·02–5% by wt. of N. Thus fibres obtained by extruding aqueous polyvinyl alcohol into satd. aq. Na_2SO_4, dried, heated for 3 min. in air at 220°C. and then treated for 15 min. in an aq. soln. containing 15% H_2SO_4, 15% Na_2SO_4 and 1·2% β-aminopropionaldehyde dimethyl acetal at 60°C., are given excellent affinity for acid dyes. C.O.C.

Delustred Nylon
Perfogit *BP* 757,324

In making delustred nylon adding to the monomer a titanium hydroxide gel obtained by hydrolysis of $TiSO_4$ results in more effective delustring than use of TiO_2. C.O.C.

Roughening and Dulling Filaments of Polyethylene Terephthalate
Vereinigte Glanzstoff-Fabriken *BP* 756,715

Filaments of polyethylene terephthalate which contain 7–12% solvent are passed, while still hot, through air for a short distance and then into cold organic liquid which is miscible with the solvent; the filaments are then stretched and treated with superheated steam. After this process the filaments are matt in appearance and the surface is no longer smooth so that pilling is reduced. W.G.C.

Acrylonitrile–Styrene Copolymer Filaments
Allied Chemical & Dye Corpn. *USP* 2,721,785

Acrylonitrile (4 parts by wt.) and styrene (1) are copolymerised in aqueous emulsion at < 75°C. in presence of an inorganic catalyst. The emulsion is cracked with the copolymer, washed, dried and dissolved to a 10–15% soln. in dimethyl formamide. This solution is then extruded into warm water and the resulting surface gelled filament containing 50–80% by wt. of dimethylformamide is dried in hot air to a dimethylformamide content of ≯ 8%. The resulting filaments yield much deeper and quicker dyeings with disperse dyes than hitherto available acrylic filaments. C.O.C.

Acrylonitrile–Protein Filaments
Courtaulds *BP* 758,214

Dissolving in a naphthacrylonitrile solution of the type described in *BP* 714,530 (J.S.D.C., **70**, 518 (1954)) a protein (not more than the wt. of the polyacrylonitrile) and then forming filaments from the solution yields a product having improved affinity for dyes, handle and moisture regain. C.O.C.

Dextran–Synthetic-resin Filaments
Commonwealth Engineering Co. of Ohio *BP* 758,112

A water-soluble precondensate is incorporated into a water-soluble dextran and the mixture extruded into a liquid which polymerises the resin and firmly sets the extruded filament, which is then heated to complete polymerisation. Thus a mixture of dextran and a formaldehyde–urea precondensate is extruded into an acid setting bath and the resulting filament baked to cure the resin. C.O.C.

Natural Coloration of Wool and the Bleaching of Naturally Coloured Wool (VII p. 611)
Effect of some White Pigments on the Actinic Degradation of Cotton (X p. 613)
Effect of Alkaline Hydrolysis on the Properties of Cyanoethylated Cotton (X p. 614)
Physical Properties of Cotton treated with β-Propiolactone (X p. 614)
Construction and Finishing of Fabrics based on Terylene Polyester Fibre in relation to Crease Recovery (X p. 615)
Auto-hydrolysis of Acidic Oxycelluloses (XI p. 617)
Rheology of Surface Films. V— Mechanical Behaviour and Structure of 6-Nylon at Air–Water Interfaces (XIII p. 618)
Colorimetric Determination of Tryptophan in Wool (XIV p. 622)

VII— DESIZING; SCOURING; CARBONISING; BLEACHING

Fundamental Aspects of Detergency
P. W. O. Wijga

World Congress on Surface-active Agents, **1**, 19–23 (1954)

In a discussion of the mechanism of a detergent process in removing soil and preventing redeposition, the importance of the presence of micelles in the detergent solution, and of electrical double layers (caused by adsorption of detergent) at the fibre and dirt surfaces, is stressed. The mechanism by which these electrical forces remove soil from the fibre is explained. A qualitative relationship between the electrokinetic potentials of the fibre and the soil, and the extent of soil removal and redeposition, is established and is used to explain the degree of detergency experienced in various systems. Emulsifying properties are needed to remove oily soil. W.K.R.

Soap–Water–Amphiphile Systems
A. S. C. Lawrence

World Congress on Surface-active Agents, **1**, 31–37 (1954)

The bulk and surface properties of ternary systems comprising soap, water, and an additive (containing > 5 C and a polar group) are described and explained. W.K.R.

Non-ionic Detergents— Solution Properties of Polyglycol Ethers
L. Raphael

World Congress on Surface-active Agents, **1**, 52–65 (1954)

A range of ethylene oxide condensates of varying hydrophilic chain length (8–30 mol. of ethylene oxide) was prepared from fatty alcohols, *iso*octylphenol, *iso*octylcresol, and benzylcresol. The viscosity cloud point, surface tension, and interfacial tension against olive oil are reported for aqueous solutions of these products at various concentrations. W.K.R.

Effect of pH on Micelle Formation
H. B. Klerens and M. Raison

World Congress on Surface-active Agents, **1**, 66–71 (1954)

The effect of pH on the critical micelle concentration (CMC) is different for (*a*) strong acids and their salts, and (*b*) weak acids and bases and their salts. With (*a*), where both acid and salt are almost completely ionised, differences in CMC appear to depend on chain length: above C_{12} the CMCs are approximately the same, but with shorter chains the CMC of the acid is much greater than that of the salt. With (*b*) the CMC of the weakly ionised component is much lower than that of the salt. W.K.R.

Surface-active and Emulsifying Properties of Cellulose Ethers
S. Fordham

World Congress on Surface-active Agents, **1**, 162–166 (1954)

The surface tensions and interfacial tensions against liquid paraffin are recorded for solutions of sodium carboxymethylcellulose (I) and methylethylcellulose (II). Interfacial tension is independent of concentration at > 1·4% I and > 0·38% II. These concentrations are approximately the same as the minimum quantities of each product required to form stable emulsions of liquid paraffin in water. It is suggested that the stable adsorbed film required to give emulsion stability is first formed at the concentration at which micelle formation occurs. W.K.R.

Influence of Trace Electrolytes on Interfacial Tensions at the Oil-Detergent Solution Interface
D. A. Haydon and J. N. Phillips

Nature, **178**, 813–814 (13 Oct. 1956)

The use of ion-free, instead of glass-distilled, water gave higher interfacial tensions at a petroleum ether–water interface when sodium dodecyl sulphate and dodecyltrimethylammonium bromide were used as detergents.

Surface potential studies show that with glass-distilled water the form of the Gibbs adsorption isotherm is—

$$\frac{kT}{A} = -c\frac{d\gamma}{dc}$$

where γ is the interfacial tension, A the area occupied per detergent molecule, k the Boltzmann constant, c the concentration, and T the absolute temperature. The form with ion-free water is—

$$\frac{2kT}{A} = -c\frac{d\gamma}{dc}$$

The difference is ascribed to specific adsorption at the interface of trace counter-ions present in the bulk of the solution. W.R.M.

Adsorption and the Deposition of Carbon on Cotton from Solutions of Sodium Dodecyl Sulphate
R. D. Vold and A. K. Phansalkar
World Congress on Surface-active Agents, **1**, 137–143 (1954)

The effectiveness of solutions of pure sodium dodecyl sulphate (I) in preventing the deposition of oil-free carbon on purified cotton cloth was studied under conditions of minimum mechanical agitation. The results are considered in relation to the degree of association of I in solution, the aggregate size distribution of the suspended carbon, and the extent of adsorption of I by the carbon and the cloth. W.K.R.

New Developments in Peroxide Bleaching
J. L. Moore and T. E. Bell
Amer. Dyestuff Rep., **45**, P 679–P 681 (10 Sept. 1956)

Single-stage continuous bleaching, single-stage kier bleaching, and a non-silicate bleach are briefly discussed. J.W.B.

Natural Coloration of Wool and the Bleaching of Naturally Coloured Wool
G. Nitschke
Faserforsch. und Textiltech., **7**, 401–407 (Sept. 1956)

The chemical structure and the properties of the natural colouring matter of wool are reviewed. Microscopic examination shows the presence of granular and diffuse pigment particles. These are rendered lighter in colour by alkaline hydrogen peroxide. In acid solutions bleaching is a slow and incomplete reduction process. A continuous process for bleaching filaments of natural colour by treatment of formalised wool with alkaline hydrogen peroxide is described. W.R.M.

Sulphated and Sulphonated Alkarylsulphonamide Surface-active Agents (III p. 591)

Factors affecting the Wettability of Cotton Fibres (VI p. 606)

Yellowing Tendency of Viscose Rayon degraded by Oxidation (VI p. 607)

Sizing of Spun Yarns containing Man-made Fibres spun on the Cotton System (X p. 613)

VIII—DYEING

Fuel Savings in Midland Dyehouses
Anon.
Dyer, **115**, 619–621 (13 April 1956)

The value of the National Industrial Fuel Efficiency Service has been amply demonstrated by a number of Midland firms, who have, by carrying out the recommendations of the N.I.F.E.S., effected considerable economies in fuel. A.H.

Tufted-carpet Dyeing Techniques
Anon.
Silk and Rayon, **30**, 956–957 (Sept. 1956)

Action of Adsorption Forces in Dyeing
C. H. Giles
Compte rend. 27th International Congress of Industrial Chemistry (Brussels, Sept. 1954)

A summary of the various forces operative during dyeing. A.J.

Fading of Dyeings in Inclement Weather
J. P. Niederhauser
Canadian Textile J., **73**, 47–53 (7 Sept. 1956)

Translation of paper published in *Teintex*, **21**, 456 (June 1956)—cf. J.S.D.C., **72**, 504 (Oct. 1956).

Donnan Membrane Equilibrium and Direct Dyeing—IV
K. Nishida
J. Soc. Textile Cellulose Ind. Japan, **12**, 592–598 (Aug. 1956)

Experimental data for the absorption on cotton at 90°C. of three dyes—Aizen Direct Blue BBH (*C.I.* 406), Diamine Blue 3B (*C.I.* 477), and Nippon Sky Blue (*C.I.* 520) (which differ only slightly in structure, being derived from benzidine, tolidine, and dianisidine respectively coupled with H acid)—were analysed by the Donnan treatment of Neale *et al.* The value of the absorption constant k and the volume of the surface phase of the fibre were determined from the results of the experiment. It was found that the volume of the surface phase increases with increased concentration of the dye. The data for low dye concentrations are analysed by the Donnan treatment using the volume [*sic*] term of 22 g. per 100 g. of cotton, whereas at high dye concentrations it is necessary to use the much larger value of 42 g./100 g. cotton. This latter value is in close agreement with the data of Boulton *et al.* for the amount of water imbibed by American cotton. Author

Rates of Desorption of Level-dyeing Acid Dyes from Wool
C. H. Nicholls
J.S.D.C., **72**, 479–485 (Oct. 1956)

A study of the initial rates of desorption of level-dyeing acid dyes from wool into sodium borate (borax) solution has indicated a linear relationship between the dye removed, expressed as a percentage of the total dye initially present, and the square root of the time. Activation energies of diffusion during desorption from wool have been determined for several dyes. The effects of method of application of dye, nature of dye, and nature of substrate on rates of desorption have been determined. The rate of desorption is controlled by the relative magnitudes of the forces of repulsion between the charged fibre and the dye anion and the forces of attraction between fibre and dye. Any fibre modification which results in an increase in the number of free acidic groups, such as dyeing at low pH values, acid chlorination, or peroxide bleaching, increases the rate of removal of dye by alkaline solution. Author

Dyeing of Mixtures of Wool with Artificial and Synthetic Fibres
J. Quenneville
Teintex, **21**, 677–695 (Sept. 1956)

A general account of unions with Fibranne (viscose rayon staple), Merinova, Ardil, Vicara, cellulose acetate, polyamide, polyvinyl, polyester, and polyacrylonitrile fibres. A number of "carriers" are discussed. S.R.C.

Dyeing of Man-made Fibres
N. Carmichael
Canadian Textile J., **73**, 50–53 (20 April 1956)

Optimum conditions are given for dyeing nylon and Perlon 6-nylon. Dyeing methods for a number of unions are described and include the use of carriers and high-temperature techniques. A.H.

Dyeing and Finishing Man-made Fibres
R. C. Geering
Canadian Textile J., **73**, 43–48 (10 Aug. 1956)

A survey of dyeing methods for fabrics made of polyamide, acrylic, and polyester fibres, and of blends of wool with the two latter fibres. A.H.

Importance of Mass Pigmentation
M. R. Priou
Teintex, **21**, 99–107 (Feb. 1956)

Certain pigments in needle form orient along the axis of the filament. Spherical forms are, therefore, to be desired. S.R.C.

Dyeing Fibre Blends other than those containing Wool
L. Biggins
Canadian Textile J., **73**, 77–82 (24 Aug. 1956)

Problems encountered when dyeing unions of cotton and silk with various man-made fibres are discussed and dyeing procedures are given for a number of fibre mixtures. A.H.

Dyeing Wool-Nylon Blends
H. Luttringhaus
Canadian Textile J., 73, 45–49 (20 April 1956)
The properties and the constitution of 6,6- and 6-nylon are discussed, and then the dyeing of these fibres as unions with wool. Methods using disperse, acid, and chrome dyes are given, and the use of anionic restraining agents for nylon is described. Mitin FF and Eulan CN are also mentioned as suitable reserving agents for nylon. A new method of applying azoic dyes to nylon–wool unions consists in the application (in one bath) of a finely dispersed stabilised diazo compound (Ofna-perl salt) and a coupling component for the nylon (subsequently developed with the dil. mineral acid), and a coupling component soluble in alcohol (Orna-lan) subsequently coupled with a developer (Orna-lan salt or base) for the wool. A.H.

Diffusion Measurements in Polyamide Fibres
W. Luck
Melliand Textilber., 36, 927–928 (Sept.), 1028–1033 (Oct), 1267–1270 (Dec. 1955)
The visual penetration zones of a dye, as registered on a microspectrophotometer, depend on the following factors—exhaustion curve and diffusion coefficient, affinity of dye (distribution coefficient), section thickness of specimen, dye absorption spectrum, wavelength of the light employed, temperature, degree of stretch, pH, and presence of other dyes. It is suggested that depth of penetration may be used as a test of dyeing properties and of compatibility of dyes. S.R.C.

Physiochemical Equilibria in the Dyeing of Polyamide Fibres with Acid Dyes
E. Elöd and P. Ney
Textil Praxis, 11, 821–825 (Aug.), 915–920 (Sept. 1956)
An investigation of physiochemical equilibria in the application of a number of acid dyes to Perlon L, including the influence of aromatic carboxy and sulphonic acids. B.K.

Effect of some Organic Acids on the Diffusion of Orange II in 6,6-Nylon
C. L. Browne and R. Steele
J. Polymer Sci., 21, 279–288 (Aug. 1956)
Sorption of 16 organic acids by nylon yarn has been studied at 30°C. Isotherms fit the empirical Freundlich equation. Heats of sorption suggest sorption by physical solution in amorphous regions. The effect of some acids on the diffusion coefficient, equilibrium sorption, and activation energy of diffusion of Orange II in nylon film has been studied. Benzoic and salicylic acids act as swelling agents and increase the diffusion coefficient of the dye. All the acids increase the activation energy of diffusion for the dye. The effects of the acids in reducing equilibrium sorption are found to depend on the dye-like character of the acid. W.R.M.

Dyeing Problems with the new Superpolyamide Fibre, Rilsan (11-Nylon)
C. Zuber and A. Baron
Teintex, 21, 771–785 (Oct. 1956)
Differences exist between 6,6-nylon, Perlon L (6-nylon), and Rilsan (11-nylon) because of the greater length of the methylene chain of the last-named. After a discussion of the raw material for the fibre, castor oil, which is made to yield ω-aminoundecanoic acid, the physical and chemical properties are compared with those of 6,6-nylon and Perlon L. Rilsan is insoluble in a range of acids at ordinary temperature and shows no loss of tensile strength after 300 hr. at 90°C. in 40% caustic soda. It is also less sensitive to oxidants. All dyes suitable for 6,6-nylon do not dye Rilsan, especially if the best wet fastness is aimed at. Disperse dyes show normal affinity and can be dyed under static pressure at 120°C. Acid dyes show less affinity than for 6,6-nylon. Chrome dyes may be applied, but the weakly hydrophilic fibre prevents full development of colour. Metal-complex dyes give good results, especially at high temperature. For blacks and deep reds, azoics can be used at atmospheric pressure. Vat dyes give only a poor yield. S.R.C.

Glycine Peptides. III— Absorption of Orange II by Polyglycine
A. B. Meggy and D. Sims
J.C.S., 2940–2948 (Aug. 1956)
Polyglycine I (I), prepared from piperazine-2:5-dione and water, and polyglycine II (II), prepared by precipitating I from $CaCl_2$ soln., both absorb Orange II from aq. soln. II absorbs dye equivalent to the total terminal amino groups in the polymer. I absorbs only 42% of the theoretical amount; heating the polymer reduces this to 13%. Conversion into II restores the absorption to 100% of theory, and the absorption by II is not affected by heating of the polymer. The affinity of the dye anion for II is −6·3 compared with −4·6 kcal./mole for wool. II, the various types of nylon, wool, silk, and other insol. proteins combine with acid dyes in amounts corresponding to their content of basic groups; only I is an exception, for no obvious reason. H.H.H.

Dermatitis from Nylon Stocking Dyes
C. D. Calman and H. T. H. Wilson
Dyer, 115, 273 (17 Feb. 1956)
Patients with nylon stocking dermatitis are allergic to the dye, and of six cases all were attributed to an azo dye, whilst stockings specially dyed with anthraquinone dyes produced negative results when patients were tested by the patch test. Synthetic-resin anti-snag finishes on hosiery are also mentioned as causes of dermatitis, although the six patients tested all showed negative results to urea–formaldehyde and melamine–formaldehyde resins. A.H.

Dyeing of New Yarns and Fabrics
I. M. S. Walls
J. Textile Inst., 47, P 724–P 734 (Aug. 1956)
This survey includes a section on the precautions necessary when dyeing bulked yarns. J.W.B.

Examples of the Dyeing of Polyacrylonitrile Fibres by the Sandocryl Process
H. Egli
Textil-Rund., 11, 527–530 (Sept. 1956)
A number of practical applications are briefly discussed. S.R.C.

Dyeing Wool–Dralon [Polyacrylonitrile] Unions
K. Bohn
Textil Praxis, 11, 828–832 (Aug. 1956)
Bulk experience in the dyeing of unions of wool and Dralon (FBy) acrylic fibre by the two-bath, one-bath two-stage, and one-bath processes. B.K.

PATENTS

Dyeing and Crimping Nylon Yarn
British Nylon Spinners *BP* 756,584
Low-twist nylon yarn (5–12 t.p.in.) is steam set, wound into cakes, dyed, further twisted in the same direction (60–100 t.p.in.), steam set under pressure and finally back-twisted to its original untwisted condition. W.G.C.

Disperse Dyeing of Polyesters of Aromatic Dicarboxylic Acids
Ciba *BP* 757,869
Terylene or the like is readily dyed by using as disperse dyes, anthraquinone dyes having a S-containing substituent which does not impart solubility in water and advantageously at least one basic nitrogenous substituent, e.g. 1-aminoanthraquinone-6-ethyl sulphone. C.O.C.

Some Aspects of *cis–trans* Isomerism in Azo Dyes (IV p. 595)
*iso*Indolenines as Intermediates in the Synthesis of Phthalocyanines (IV p. 600)
Factors affecting the Wettability of Cotton Fibres (VI p. 606)
Action of Acids and Alkalis on Fibroin in presence of Salts of Organic Acids (VI p. 608)
Review of Developments in the Properties, Processing, and Utilisation of Man-made Fibres (VI p. 608)
Effect of Alkaline Hydrolysis on the Properties of Cyanoethylated Cotton (X p. 614)
Method of Calculating Diffusion in Fibres coupled with Irreversible Adsorption or Rapid Reaction (XI p. 617)

IX— PRINTING

Behaviour of Formaldehyde-sulphoxylate in Vat Printing
R. Thornton and W. F. Liquorice
J.S.D.C., 72, 472–478 (Oct. 1956)
An experimental method for the determination of the Formosul concentration on a print, described in the paper,

has been used to investigate the rate of decomposition of Formosul during the various stages of the vat printing process. The effects of the constituents of the print paste, drying and storage conditions, temperature, and conditions during steaming are examined. AUTHORS

Direct Printing with Vat Dyes by the Rongalite C–Potash Method—III
G. Bernardy
Melliand Textilber., **37**, 189–197 (Feb. 1956)
The special importance of correct steaming in the Rongalite C–potash process is discussed, and the interdependence of factors such as type of steam, quality of steam, steaming time and time of fixation of the vat dye are emphasised. H.K.

Screen Printing of (Sports) Hose
A. Franken
Tintoreria Industrial, (18), 395–405 (Aug. 1956)
The articles are fitted on cylinders of accurate diameter and printed with e.g. pigment colours in an automatic screen-printing machine (GP 894,539), with the flat screen below and the hose-cylinder unit above. Considerations such as choice of thickening are the same as in conventional screen-printing (illustrated). S.R.C.

PATENTS

Stable Oil-in-water Emulsions for Pigment Printing
Ciba *BP* 757,740
Dispersions of considerable amino plastic in an aqueous solution of acid casein can be mixed with latices of natural or synthetic rubber without impairing either the degree of dispersion or the stability of the latices. Use of such mixtures in pigment printing yields prints of good fastness to washing and rubbing without unduly affecting the handle or flexibility of the printed material. C.O.C.

Stencil Printing Cylinders for Printing on Textiles
A. J. C. de O. Barros *BP* 756,315
A cylindrical metallic mesh screen on which the stencil has been formed is plated with metal so as to make it rigid and durable without destroying the stencil.
C.O.C.

Resist Printing of Cellulosic Textiles
ICI *BP* 757,073
A thickened resist paste containing a water-soluble salt of Ca, Sr, Ba, Al, Sn, Pb, Zn, Cd, Fe or Mn is applied to the material which is then padded with an alkaline leuco vat dye, or with an aqueous dispersion of a vat dye, and then with a reducing agent, heated at 95–105°C. and finally oxidised. C.O.C.

Coloured Patterns on Suède Leather, Cloth, etc.
J. V. Hastings and A. A. Shoenberg *USP* 2,721,817
The leather or cloth is covered with a stencil, a transfer is placed above the stencil, and then pressure of ca. 1000 lb. per sq.in. is applied for 5–10 sec. to force the adhesive on the transfer through the stencil openings onto the leather or cloth. The transfer is made of at least 6 coats of adhesive applied to a suitable backing. When the pressure is released, the backing is stripped from the adhesive which remains anchored to the leather or cloth. The adhesive may be covered or the transfer backing may be coated with a coloured material, e.g. cathodically deposited metal, before the adhesive layers are applied to it. C.O.C.

Printing on Polyethylene and Similar Plastics
A. B. Dick Co. *USP* 2,721,821
A carrier, e.g. thin paper or regenerated cellulose sheeting, preferably transparent or translucent, printed or coated with an ink or paint, is placed against the polyethylene. Radiant energy is directed on to the assembly so that it is absorbed by the material in the ink or paint and converted into heat. The amount of heat generated is sufficient to modify the surface of the polyethylene so that the ink or paint may transfer from the carrier and become embedded and/or integrated into the polyethylene surface. C.O.C.

Continuous Multicolour Photogravure Printing on Films of Regenerated Cellulose, Cellulose Acetate, Polyvinyl Chloride, or similar Plastic
Cellophane Investment Co. *BP* 757,832
Method of ensuring accurate lengthways registration of the various colours. C.O.C.

Azo Dyes formed by Coupling with Reactive Methyl Groups (IV p. 595)
iso-Indolenines as Intermediates in the Synthesis of Phthalocyanines (IV p. 600)
Improving the Adhesion of Printing Inks, etc. to Polyethylene (XIII p. 618)

X—SIZING AND FINISHING

Sizing of Spun Yarns containing Man-made Fibres spun on the Cotton System
E. Bradbury
J. Textile Inst., **47**, P 619–P 637 (Aug. 1956)
With spun viscose rayon, sizing problems are mainly concerned with the influence of sizing treatments on finished cloth quality. Complete removal of size in desizing is essential, and several reasons are put forward why this may not take place, e.g. precooling followed by reboiling, and slow drying of the sized yarns, are both deleterious. A simple method is indicated whereby laboratory tests can be made on starch films prepared under different conditions. Some easily removable starches are considered, and tamarind powder, chosen for thorough examination because of cheapness, may offer a temporary solution to these problems. Circumstantial evidence is offered suggesting that listing faults may be caused by differences in sizing conditions across the cloth, probably through changes in the anisotropic diffusion coefficient. Reasons are presented for hairiness commonly found in sized spun nylon yarns. The fault is worse with high-denier fibres, and can to some extent be remedied by means of fibre laying. Different sizes for nylon are discussed, together with sizes for blends, where adhesion problems are particularly complicated. J.W.B.

Investigation of the Uniformity of Drying Processes by means of Frequency Distributions
R. Burgholz
Textil Praxis, 11, 803–807 (Aug.), 925–931 (Sept. 1956)

New Theory of Raising for Double-acting Raising Machines
M. Kato
J. Soc. Textile Cellulose Ind. Japan, **12**, 111–115 (Feb. 1956)
Raising power is said to depend upon the relative velocity between the cloth and the point of the raising wire of the counter pile roller, the cloth being raised by this sliding action. In practical raising, however, no sliding action could be observed and raising power was equal to the raising effect. By the differential motion, the counter pile rollers are rotated with the cloth and with the belt band, the difference of rotation counts reducing the raising power and the counter pile rollers driving on the cloth without sliding: the fibres are lifted when the points of the raising wire leave the cloth. Moreover, the raising effect depends upon the time of contact of the wire point with a definite length of the cloth. How the running direction of the raised pile affects practical application has not yet been discussed, but if only the relative velocity between the cloth and the wire point were effective, the result should be the reverse of what is found in practice.
AUTHOR

Effect of some White Pigments on the Actinic Degradation of Cotton
W. R. Hindson and P. G. Kelly
Nature, **177**, 1241–1242 (30 June 1956)
Grey cotton duck coated with a synthetic resin containing a white pigment (lithopone, anatase, rutile, antimony oxide, white lead, or zinc sulphide) is tendered when exposed to sunlight for twelve months. The loss in strength due to anatase is considerable (up to 98% with 3% of pigment). Lithopone used alone has a much smaller effect, which is increased in admixture with anatase. Added rutile has a protective effect. The different actions of anatase and rutile are ascribed to differences in crystal structure; anatase can be photoreduced, atomic oxygen thus being liberated to attack the substrate. A.J.

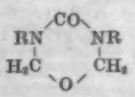
Photodegradation of Fibres
A. Agster and O. Holzinger
Textil Praxis, **11**, 825–828 (Aug. 1956)
Experiments are described comparing the photodegradation of bright and titania-delustred viscose rayon under varying conditions. It is shown that the presence of titanium dioxide promotes degradation on exposure of the fibre. B.K

Effect of Alkaline Hydrolysis on the Properties of Cyanoethylated Cotton
L. W. Mazzeno, R. M. Reinhardt, J. D. Reid, and J. B. Dickson
Text. Research J., **26**, 597–606 (Aug. 1956)
Rates of cleavage of cyanoethyl groups by 1% NaOH at 22°, 60°, and 97°c. have been measured, and the effect of the treatment on the properties of the fabric has been studied. Resistance to rotting is very susceptible to alkaline hydrolysis and is destroyed by partial removal of cyanoethyl groups. Heat resistance decreases, but only to the extent to which nitrogen is removed. Dyeing characteristics show reversion to the colour of untreated cotton when only half the nitrogen has been removed. Physical properties are not adversely affected. It is recommended that alkaline after-treatment of cyanoethylated cotton at temp. above 25°c. be avoided. J.C.F.

Physical Properties of Cotton treated with β-Propiolactone
E. H. Nott and J. N. Grant
Text. Research J., **26**, 673–680 (Sept. 1956)
Cotton yarns were treated with β-propiolactone (*a*) in xylene and (*b*) in aqueous alkali to give weight increases of up to 37%. The reaction involves graft polymerisation. The density of the material decreased linearly with take-up, but showed variations depending on pre-extraction solvent and method of treatment. Tenacities of single fibres were decreased beyond the values expected for a mere change in linear density, indicating some degradation of the cellulose. Treated samples showed a slightly reduced resistance to heat. Frictional resistance against steel was increased for yarns treated by method (*a*), but not for those treated by method (*b*). Electron micrographs show surface deposits of polymer on (*a*)-, but not (*b*)-treated samples. J.C.F.

Copper Process for Prolonged Microbiological Protection of Cellulosic Fabrics by Chemical Modification
E. Abrams and R. R. Bottoms
Text. Research J., **26**, 630–640 (Aug. 1956)
A description of the NCG (National Cylinder Gas Co.) Fabric Preservative Process. The fabric is impregnated with aqueous copper formate solution, dried, and autoclaved at 120°c. for 20–30 min. The copper is chemically bound in the treated fabric and appears to be involved in cross-linkages between cellulose chains. Treated fabric is resistant to pure cultures of cellulolytic organisms and survives for relatively long periods in biologically active soil. The treated fabric is a light tan colour: it may be dyed in the same way as untreated cotton, but the colours are somewhat modified. J.C.F.

Urea–Formaldehyde Condensation. XV—Hydroxybenzylurones
G. Zigeuner and W. Hoselmann
Mh. Chem., **87**, 406–420 (June 1956)
The action of formaldehyde on hydroxybenzylureas yields hydroxybenzylurones, i.e. cpd. of type I—



(I)

These can be converted into ethoxybenzylurones, which are also synthesised independently. Cleavage by means of *m*-4-xylenol is investigated, and can be used to show the presence of urone rings only when dimethyleneurone, but not monomethyleneurone or dimethylenemethylene-diurone, structures are present. H.E.N.

Crease-resistant Finish with Urea-Formaldehyde Resin
IX—Method of Crease-resistant Finishing using Picoline Betaine Hydrochloride as Catalyst
M. Hida, T. Sato, F. Toda, Z. Sato, N. Hasebe, T. Abiko, B. Nunokawa, and S. Takayama
J. Soc. Textile Cellulose Ind. Japan, **12**, 495–499 (July 1956)
Picoline betaine hydrochloride has the properties of a good latent catalyst, gives good stability to the resin solution, and yields excellent, uniform effects on the fabrics. The best conditions for practical treatment have been determined.

X—Mechanism of the Crease-resistant Finish with Uncondensed Urea-Formaldehyde Solution
M. Hida
Ibid., 584–588 (Aug. 1956)
The author has pointed out in previous papers that the formation of the chemical cross-linkage between cellulose molecules is one cause of the crease-resistance of the fabric, but the main cause is the deposition of resin in the amorphous regions of the fibre. Resin should be deposited firmly and have good water resistance, and is not to be deposited between the micellæ of the cellulose molecule physically, but with physicochemical cross-linkage of the resin by the formation of co-ordinate links to the hydroxyl groups of the cellulose molecule. AUTHORS

Distribution of Resin during Resin Finishing of Fabrics
S. Yokoyama
I—New Method for the Determination of the Resin Distribution
J. Soc. Textile Cellulose Ind. Japan, **12**, 574–579 (Aug. 1956)
Six sheets of filter paper of the same size are piled together and pressed to adhere closely, and this pile is treated as a sheet of cloth as is usual in resin finishing. After baking the pile, each paper is separated. If the weights of each filter paper before and after resin finishing are given by W_i and W_i' respectively, the resin distribution D_i on each paper can be calculated from the following equation—

$$D_i = \frac{W_i' - W_i}{\Sigma(W_i' - W_i)} \times 100\,(\%)$$

In this method the resin distribution is represented by the three components—

Outer resin $= D_1 + D_6\,(\%)$
Intermediate resin $= D_2 + D_5\,(\%)$
Inner resin $= D_3 + D_4\,(\%)$

II—Effect of Predrying Temperature on the Resin Distribution
Ibid., 579–583
In order to investigate the migration of resin during predrying, which should markedly affect the formation of surface resin during the finishing of fabric with thermosetting resins, the effect of temperature of predrying on the resin distribution was examined. The following relations were derived—(1) The quantity of resin migrating during the predrying increases with the predrying temp. up to a certain value. (2) Comparing the results obtained for 15% and 8% baths, the effect of temp. is greater in dilute solution than in concentrated solution, and the temp. at which the migration of resin becomes steady is about 100°c. for a 15% bath, and 90°c. for an 8% bath. (3) A linear relation exists between the inner resin distribution and the outer one. Therefore, if one of them is known, the other can be calculated. AUTHOR

Shrink-resisting Wool—Novel Features and Description of a New Process
A. N. Davidson and R. Preston
J. Textile Inst., **47**, P 685–P 707 (Aug. 1956)
Shrink-resist processes are reviewed, and methods of obtaining novel, e.g. blister and artificial crêpe, effects are indicated. A new method is described in detail, together with experiments leading to the discovery of optimum conditions. It comprises either a two-bath process using peracetic acid and papain, or a single-bath process using a mixture of sodium hypochlorite and peracetic acid. Under commercial conditions the latter is preferable, needing cheaper materials, room temperature, little attention to

detail, and neutral or slightly acidic conditions. Advantages include a bleached finish, and a reduced dye uptake which assists level dyeing. J.W.B.

Processing and Properties of Knitted Stretch Fabrics
D. L. Munden and M. W. A. Fletcher
J. Textile Inst., **47**, P 638–P 669 (Aug. 1956)

This survey includes a discussion of suitable heat-setting and wet-finishing treatments for knitted stretch fabrics. Wet relaxation treatment is important prior to heat-treatment, in order to minimise risk of boarding out or variation in finished length. Accurate temperature control is necessary in both yarn-setting and fabric-setting treatments. J.W.B.

Silicones— Textile and other Applications
W. W. Cuthberteon
J. Textile Inst., **47**, P 788–P 794 (Sept. 1956)

A survey is given of the applications of silicones in the fields of textiles, leather, paper, glass, rubber, and resins. J.W.B.

Construction and Finishing of Fabrics based on Terylene Polyester Fibre in relation to Crease Recovery
N. M. Mims and E. D. Rossiter
J. Textile Inst., **47**, P 708–P 723 (Aug. 1956)

The behaviour of fabrics containing Terylene fibre, wool, and blends of the two are compared. Although the two fibres are in many ways similar, wool is primarily affected in its crease recovery by the presence of moisture, while Terylene is subject to non-recoverable deformation at high temperatures, higher than those encountered in wear. Firm-sett fabrics containing Terylene have poorer crease recovery than those of open sett. Significant differences in crease recovery can be obtained by laboratory steam treatments, but no corresponding differences have been found by modifying conditions when using woollen and worsted finishing machinery. J.W.B.

Waterproof Finishes on Polyacrylonitrile Fibres
R. Keppler
Textil Praxis, **11**, 921–924 (Sept. 1956)

Investigations into the waterproofing of acrylic fibres using four different techniques— single-bath impregnation, two-bath method with soap and zirconium oxychloride, silicone emulsion, and single-bath impregnation with the addition of softener. The results are compared for waterproof effect, resistance to washing, and handle. B.K.

Acetalisation of Polyvinyl Alcohol Fibre with Dialdehydes. II— Acetalisation with Terephthalaldehyde
K. Tanabe and K. Ōno
J. Soc. Textile Cellulose Ind. Japan, **12**, 543–548 (Aug. 1956)

Heat-treated and unheated polyvinyl alcohol fibres are acetalised with terephthalaldehyde. The acetalisation is peculiarly influenced by the concentration of sulphuric acid used as catalyst. As the concn. is increased, the initial rate of reaction becomes greater, but the subsequent rate is more rapidly decreased, and the apparent extent of reaction at equilibrium seems to be lower. The wet-heat resistance of acetalised fibre is chiefly determined by extent of reaction rather than by conditions of reaction, differing from the case of acetalisation with glyoxal. When the heat-treated fibre is acetalised to several, $>$ 10, or $\sim$ 20 mole %, the fibre can resist water at 100°, 120–130°, or 140°C. respectively. The percentage is computed from weight increase due to the reaction by assuming that all bound terephthalaldehyde is cross-linked between molecules of polyvinyl alcohol. When even the unheated fibre is acetalised to $>$ 20 mole %, it resists water at 100–140°C. These results show that terephthalaldehyde cross-links much more readily than glyoxal. The tensile recovery of the acetalised fibre is very high, but the tenacity, the breaking extension, and particularly the knot strength generally tend to decrease as compared with formalised fibre, though the extents of these decreases depend on the concn. of sulphuric acid in the acetalising bath. The unusual effect of the H_2SO_4 concn. on the rate of reaction and on the tenacity and extension seem to be due to differences of distribution of the cross-links within the fibre. AUTHORS

PATENTS

Chemical Modification of Cellulose
Fothergill & Harvey *BP* 757,386

Cellulose is treated with a bisglycidyl ester of a polyhydroxyphenol in presence of an alkali-metal hydroxide and heated. The resulting cross linking gives reduced swelling in water and the groups carried by the cross linkages are available for use either in themselves or by chemical treatment for securing further modification. Thus viscose rayon was treated in 18% NaOH for 10 min., lightly pressed between filter paper and then treated in bromohydroquinone bisglycidyl ether for 5 min. at 120°c. It was then washed with acetone, dilute sulphuric acid and water and air dried. The treated fibres were insoluble in cuprammonium hydroxide. The bisglycidyl ether was obtained by treating monobromohydroquinone (19 g.) in epichlorohydrin (45) at 80°c. with NaOH (98) in water (18 c.c.) extracting with ether and distilling under reduced pressure. C.O.C.

Treating Cellulose Fibres with β-Propiolactone
U.S. Secretary of Agriculture *USP* 2,721,784

Cellulose fibres are treated with β-propiolactone at 50–155°c. until they contain 0·5–26·0% β-propiolactone substituents. The lactone may be used either as a liquid or vapour and in presence or absence of a solvent or catalyst. The treated fibres have marked increase in diameter and decreased affinity for water and polar compounds without decrease in tensile strength. They have resistance to dyes, heat, acidic degradation and creasing and their wool-like properties are markedly greater. C.O.C.

Adhesion of Rubber to Rayon Tyre-cord
Atlas Powder Co. *BP* 756,709

The pick-up of rubber latex on rayon tyre-cord is improved by pretreating the yarn with 0·25–5% of a water-soluble waxy lubricant, e.g. a condensation product of ethylene oxide and castor oil containing 300 oxyethylene groups per mol., and a water-soluble colloidal binder, e.g. sodium carboxy methyl cellulose. W.G.C.

Sizing Glass Fibres
Owens-Corning Fiberglas Corpn. *BP* 755,957

Glass fibres are given improved handle and rendered more adhesive and more readily wetted with resinous solutions by treatment with an aqueous composition containing a film-forming saturated polyester resin containing no cross-linkages and an organo-silicon compound. C.O.C.

Rendering Cellulosic Materials Flame-resistant
National Lead Co. *BP* 755,958

The material is treated with an aqueous solution of chlorides of tetra- and trivalent titanium, the solution gelatinised in the fibre, neutralised with alkali and then washed and dried. The treated material remains unaltered in appearance, texture and tensile strength. The finish is fast to washing. C.O.C.

Crease-resistant Finish for Pile Fabrics
Denholme Silk Weavers (British) *BP* 755,939

Impregnating the pile with an aqueous solution at pH $>$ 6 of a crystalloidal condensate of a synthetic resin there being dispersed in the solution a polysiloxane which can be rendered infusible by heat, drying and baking, imparts both a crease-shedding finish and water-repellency. C.O.C.

Improving the Water-absorption Capacity of Polyamide Fibres
FBy *BP* 757,274

The fibres are treated with an aqueous alcoholic emulsion of an alcohol-soluble mixed polyamide in presence of a linear polyester produced from a dihydric alcohol and a dibasic acid. Thus the polyamide formed from equal parts of caprolactam and hexamethylene diamine adipate (4 parts by wt.), glycol (10), methanol (180), water (25), and polysuccinic acid glycol ester (10) are slightly warmed until a clear solution is formed. This is poured into water (1500–4500), heated to 30°c. and acetic or citric acid (3–4) added. Nylon knitted fabric is heated to 45–50°c. in the resulting liquor in 20 min., centrifuged and dried at 100°c. The treated fabric has very great water absorption which is further increased by soaping. C.O.C.

Patterned Mechanical Finish
Cilander *BP* 757,322

The contrast effect of mechanically produced patterns on cloth is improved by treating it with an agent which shrinks the unaltered parts of the cloth more than it does the mechanically altered parts, then smoothing the cloth by stretching or tentering it, particularly during drying and, if desired, stabilising it in this state by applying a resin finish. C.O.C.

Suède Finish on Knitted Fabrics containing both Heat-shrinkable and Non-heat-shrinkable Fibres
M. J. A. Laval *BP* 758,102

Knitted fabric containing some fibres which shrink when heated and some which do not is made to resemble suède fabric or buckskin by subjecting it to a number of heat-shrinking operations. Some of these treatments are carried out while the fabric is moist and the others while it is dry, the fabric being raised or roughened between the two sets of treatments. C.O.C.

Ornamentation of Fabric
Bleachers' Assocn. and Bradford Dyers' Assocn. *BP* 758,005

The fabric is compressively over-shrunk in length so that it will extend when wetted. This shrinkage is then fixed in selected regions, e.g. by means of a thermosetting resin, after which the fabric is wetted. This causes the unfixed portions of the fabric to return to their normal relaxed dimensions thus forming crimps, puckers or blisters in patterns in the fabric. C.O.C.

Water-repellent Finish
Wacker-Chemie *BP* 755,949

The materials are impregnated with a polymerised or hydrolysable and condensable organo-silicon compound, which imparts water-repellency at low temperatures, before, during or after impregnation with a zirconium compound. The effect of the zirconium compound is to increase the fastness to washing of the finish. C.O.C.

Compressive Shrinking and Finishing of Woven Fabrics
Cluett, Peabody & Co. *USP* 2,721,370

A pair of rolls pass the fabric to a conditioner whence it passes to a stretcher device. Here the conditioned fabric is brought to the required width and passed into a hot cylinder against which it is pressed for part of its passage by a rubber belt. The cloth contacts the cylinder before the belt exerts pressure on it. The cylinder rotates at such a speed that the cloth passes over it at a slower rate than it is fed to it both these speeds being under control. Finally the cloth passes into a felt belt continuous drying machine, the felt belt travelling at a speed less than that at which the cloth enters the apparatus but greater than that of the rubber belt. C.O.C.

Setting Keratinous Fibres
National Lead Co. *BP* 756,002

The titanate or zirconate of an amino alcohol of formula $HO{\cdot}R^1{\cdot}NR^2R^3$ (R^1 = ethylene which may be substituted by Alk; R^2 = β-hydroxyalkyl or β-aminoalkyl; R^3 = H, Alk or 1–3 C, β-hydroxyalkyl or β-aminoalkyl), e.g. the ester obtained from 2 mol. butyl titanate and 3 mol. diethanolamine, is used as the setting agent after the fibres have been treated with a reducing agent, e.g. alkali sulphite or bisulphite. C.O.C.

Coating Cellulose Acetate with Polyvinyl Chloride
BrC *BP* 758,512

The polyvinyl chloride is applied as a dispersion containing no other liquids than plasticisers, a cyclic plasticiser being present as catalyst, the coated material then being heated to gel the polyvinyl chloride. C.O.C.

Printed Felt-base Floor Coverings
ICI *BP* 758,594

When coating printed felt-base floor coverings with the interaction product of a polyhydric alcohol-polybasic acid condensate and an organic poly*iso*cyanate, better adhesion is obtained if an anchor coating of an organic poly*iso*cyanate-polyhydric alcohol condensate is first applied. C.O.C.

Coating Nylon Fabric with Polyurethane Elastomers
United States Rubber Co. *USP* 2,721,811

Successive treatments of nylon fabric with a polyester-di*iso*cyanate intermediate reaction product and a catalyst produce in a rapid and efficient manner a fabric coated with a rubbery polyurethane. Such fabrics are especially suitable as shoe upper material of hitherto unknown resistance to wear. C.O.C.

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Action of Oil on Rubber Threads (VI p. 608)
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Carboxymethylcellulose. I—Viscosity–Molecular Weight Relationships in Various Solvents (XI p. 617)
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Wash-and-wear Fabrics (XIV p. 623)
Condensates for Resin Finishing. XVIII–XX—Method of Detecting the Optimum Baking Time on Resin-treated Fabrics (III–V) (XIV p. 623)

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Practical Application of Fluorescent Brightening Agents to Paper and Board
J. Gessner

Paper Trade J., **140**, (4), 26–27 (1956): *Chem. Abs.*, **50**, 11667 (25 Aug. 1956)

Fluorescent brightening agents are effective on all bleached furnishes but less so on furnishes containing 20% ground or > 25% unbleached sulphite. Beater application is necessary for bond, writing and lightweight papers but surface application must be used on heavier stock. They are most effective in absence of size or alum. Although not fast to light or storage they are sufficiently fast for most grades of paper. C.O.C.

Investigation upon Dissolving Pulp
H. Sobue and T. Koshizawa

III—Reactivity of Sulphite Pulp in Emulsion Xanthation

J. Soc. Textile Cellulose Ind. Japan, **12**, 448–453 (July 1956)

IV—Comparison between the Effects of Sulphite Cooking, Hypochlorite Bleaching, and Alkali-ripening upon the Chain-length Distribution of Alkali Cellulose

Ibid., 453–458

Chemical Stability of the *S*-Methyl Xanthates of some Simple Alcohols
D. L. Vincent and C. B. Purves

Canadian J. Chem., **34**, 1302–1314 (Sept. 1956)

n-Octadecyl *S*-methyl xanthate (I) and *n*-hexadecyl *S*-methyl xanthate (II) are used to study the behaviour of the *S*-methyl xanthate group (III) toward reagents commonly used in research on carbohydrates. Although stable to some conditions of acetylation, hydrolysis, and methanolysis, III was destroyed by all methylating agents tried, with the exception of nitrosomethylurethan, which converted a sodium xanthate salt to the *S*-methyl ester in high yield. I and II are oxidised by H_2O_2 to afford cryst. substances of composition $C_{38}H_{76}O_4S_2$ and $C_{34}H_{68}O_4S_2$, each containing three additional O atoms. Attempts to estimate II by oxidation with bromine or periodic acid, or by reduction to methyl iodide, were unsuccessful. H.H.H.

Infrared Spectra of Crystalline Modifications of Cellulose
H. J. Marrinan and J. Mann

J. Polymer Sci., **21**, 301–311 (Aug. 1956)

Bands due to stretching of OH groups of crystalline modifications of cellulose have been measured. Cellulose III prepared from Cellulose I (III_I) differs from that prepared from Cellulose II (III_{II}). Different Cellulose IVs were obtained from Celluloses I and II (IV_I and IV_{II}). Infrared spectra suggest that only one of these, III_I, has a crystal structure distinctly different from those of I and II. The unit cells of III_{II} and II differ, suggesting that hydrogen bonding in these two forms is of the layer type in the (101) plane. W.R.M.

Conversion of Cellulose into a Readily Hydrolysable State by Thermal Treatment
V. I. Sharkov, O. A. Dobush, and N. G. Kuchina

J. Appl. Chem. U.S.S.R., **29**, 927–929 (June 1956)

Treatment of cellulose or hydrocellulose (cellulose boiled with 10% H_2SO_4 for 6 hr.) in kerosene at 200°c. for 3 hr. increases the yield x (%) of soluble carbohydrate formed

during boiling with 10% H_2SO_4 for 3 hr. Other treatments, e.g. mercerisation and grinding under kerosene, have similar effects, and combinations of these various treatments can give very high values of x. Thus, for wood hydrocellulose, x is 7·0%, after mercerisation it is 16·2%, after heat treatment in kerosene 16·6%, after mercerisation and heat treatment in kerosene 42·0%, and after grinding under hot kerosene 62·7%. These changes are attributed to the opening of the crystalline region of the fibre.

A.E.S.

Periodate Oxidation of Cellulose and Formaldehyde-treated Cellulose

M. Kärrholm

J. Textile Inst., **47**, T 453–T 463 (Sept. 1956)

Kinetics of the periodate oxidation of viscose rayon cellulose and formaldehyde-treated cellulose are studied. No positive evidence is found that the Malaprade stage of the oxidation can be resolved into faster and slower regions corresponding to the oxidation of more and less accessible regions respectively. The extent of the Malaprade oxidation of the formaldehyde-treated samples is much lower than the theoretical minimum value, indicating that all the "free" glycol groups are not accessible to the periodate. Assuming that the rate of reaction between the glycol groups and the periodate ion is much faster than the rate of diffusion of the periodate ion, the coefficient of diffusion of the ion is calculated by a method due to Olofsson (*ibid.*, T 464). The value found, $12·7 \times 10^{-6}$ cm.^{2}/min. at 23°c., is of the same order as the constants reported for comparatively rapidly diffusing direct dyes. Rate of diffusion is decreased by formaldehyde treatment: for cellulose containing 2·7% of fixed CH_2O the constant is about $1·7 \times 10^{-6}$ cm.^{2}/min.

J.W.B.

Auto-hydrolysis of Acidic Oxycelluloses

G. F. Davidson and T. P. Nevell

J. Textile Inst., **47**, T 439–T 444 (Aug. 1956)

The instability of oxycelluloses prepared by treatment of cotton cellulose first with periodate and then with chlorous acid is further studied. The stability of those kept in the free-acid form under given conditions of moisture regain and temperature decreases with increasing carboxyl content, and the rate of decomposition of a given oxycellulose increases with increasing temperature at constant regain and with increasing regain at constant temperature. If the carboxyl groups are in the form of Na salts, the oxycelluloses are stable (when air-dry) up to 30°c. Treatment of the free-acid form with boiling water leads to loss in weight and carboxyl content and to the formation of soluble acidic products. Viscometric measurements suggest that some of the links in these oxycelluloses are more easily hydrolysed by acid than are the normal glycosidic linkages in cellulose. This enhanced susceptibility to acid hydrolysis of certain glycosidic linkages may be due to the proximity of carboxyl groups.

J.W.B.

Method of Calculating Diffusion in Fibres coupled with Irreversible Adsorption or Rapid Reaction

B. Olofsson

J. Textile Inst., **47**, T 464–T 476 (Sept. 1956)

The problem of calculating diffusion coefficients in a fibre in cases where the diffusing substance is irreversibly adsorbed or reacts with the fibre is discussed and a mathematical interpretation is presented. This is applied to the consumption of periodate by cellulose (Kärrholm, *ibid.*, T 453).

J.W.B.

Formazan Reaction of Cellulose oxidised with Nitrogen Dioxide

L. Mester and E. Mocźar

Chem. and Ind., 823 (11 Aug. 1956)

Cellulose, when oxidised with nitrogen dioxide, retains its fibrous structure and undergoes the formazan reaction for aldehyde groups.

A.J.

Preparation of Tetrazolium Derivatives of Polysaccharides

L. Mester and E. Mocźar

Chem. and Ind., 848 (18 Aug. 1956)

The bright red formazans of polysaccharides (see above abstract) are converted into colourless tetrazolium compounds by the action of *N*-bromosuccinimide. The formazans are regenerated by alkaline reduction with ascorbic acid.

A.J.

Polymer-analogous Denitration of Polysaccharide Nitrates—A Study of some Reduction Methods with Model Compounds and Cellulose Nitrate

E. P. Swan and L. D. Hayward

Canadian J. Chem., **34**, 856–862 (July 1956)

D-Mannitol penta- and hexa-nitrates, methyl-β-D-glucopyranoside tetranitrate, and maltose and cellobiose octanitrates, as model compounds for polysaccharide nitrates, were smoothly denitrated by catalytic dehydrogenation using Raney nickel, yielding the parent carbohydrates in almost 100% yield. Homogeneous catalysis, using cupric acetate in pyridine, did not give complete denitration of the model compounds. Cellulose nitrate was partly denitrated by dehydrogenation with Raney nickel catalyst. Hydrolysis of Grignard adducts and reduction with lithium aluminium hydride gave lower yields of carbohydrate when used with the model compounds. It is concluded that catalytic dehydrogenation is a possible method of denitrating polysaccharide nitrates whilst leaving the polymer skeleton unaltered.

A.J.

State of Solution of Cellulose Nitrates in Very Dilute Acetone Solutions

A. Frey-Wyssling and H. Meier

Svensk Papperstidning, **59**, 501–502 (31 July 1956)

Electron micrographs of dried very dilute cellulose nitrate solutions support Staudinger's theory of the molecularly dispersed nature of the solutions and refute Dolmetsch's theory of the persistence of native biological elements such as fibrils.

K.W.

Methylation of Cellulose Acetate

L. Rebenfeld and E. Pacsu

J. Polymer Sci., **21**, 273–277 (Aug. 1956)

In an attempt to determine acetyl group distribution in a secondary cellulose acetate, ethereal diazomethane was used as methylating agent. Some reaction with acetyl groups seems possible, resulting in the introduction of methoxyl groups.

W.R.M.

Carboxymethylcellulose. I—Viscosity – Molecular Weight Relationships in Various Solvents

J. Schurz, H. Streitzig, and E. Wurz

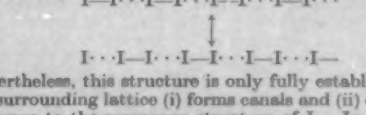
Mh. Chem., **87**, 520–525 (Aug. 1956)

Inclusion Compounds of Cyclic Dextrins with particular reference to the Blue Iodine Compounds

F. Cramer

Rec. Trav. chim., **75**, 891–901 (June 1956)

A short summary of the known inclusion compounds of the cyclic dextrins (I) is given. I are obtained from starch as ring molecules containing 6, 7, or 8 glucose units and having free diam. of 6, 8, or 10A. I form, amongst others, inclusion compounds with Cl_2, Br_2, and I_2. The blue I_2 compound is important to an understanding of the starch–iodine complex. In various ways it has been established that I_2 in enclosed chains can take up the structure—



Nevertheless, this structure is only fully established when the surrounding lattice (i) forms canals and (ii) contributes electrons to the resonance structure of I_2. In many blue iodine addition compounds, e.g. with coumarin and flavone derivatives, X-ray methods have established the existence of independent iodine chains, whereas in others iodine and the host molecule form discrete crystallographic units. The energetic relations between I_2 and the enclosing lattice resemble those of the benzene–iodine complex of Mulliken. The enclosing lattice behaves as a Lewis base. Thus, the iodine inclusion compounds should not be regarded as pure inclusion compounds in the sense of having a single spatial arrangement, but constitute a transition to the charge-transfer complexes. Cyclic dextrins enable the behaviour of inclusion compounds in soln. to be studied, so that information on the energetic relations in the empty spaces may be obtained.

A.J.

Preparation of Thionic Acid Phenylhydrazide Derivatives of Polysaccharides

L. Mester and E. Mocźar

Chem. and Ind., 874 (25 Aug. 1956)

The action of H_2S on the formazan derived from starch or dextrin in pyridine–ethanol soln. gives the corresponding thionic acid phenylhydrazides.

A.J.

Alkaline Hydrolysis of Glucosidic Linkages
B. Lindberg

Svensk Papperstidning, **59**, 531–534 (15 Aug. 1956)

Phenyl glycosides and glycosides of β-substituted alcohols are the most important types of glycosides hydrolysed by alkali, and the reaction mechanism of the hydrolysis is briefly summarised. It has also been found that ordinary glycosides, such as methyl-β-D-glucopyranoside and cellobitol, are degraded by alkali under drastic conditions, e.g. by 10% aq. NaOH at 170°C. Preliminary results suggest a reaction mechanism analogous to that of the alkaline hydrolysis of phenyl glycosides. On the basis of these observations, a possible mechanism of the degradation of polysaccharides during alkaline cooking is outlined. K.W.

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Structure and Deformation of Collagen Fibres. II—Morphology of Collagen Fibres
A. J. Cruise

J. Soc. Leather Trades Chem., **40**, 321–329 (Oct. 1956)

It has been shown, by means of a pressure technique, the use of phase-contrast polarised light, and interferometric methods, that "collagen-type" fibres exhibit fundamental structural differences, which can be associated with variations in chemical and physical properties. In addition to "normal" collagen (in which the fibre bundles are formed from more or less parallel fibres and which exhibit certain well defined and well known general properties) five variants are recognised (rediminulous, vitreous, braided, barbed, and jointed or segmented), defined, and discussed. Some of these variants fail to swell in acid and alkaline media, do not exhibit hydrothermal shrinkage, and resist many of the usual histological stains for collagen. This resistance to swelling, etc. is accompanied by an increase in birefringence, in resistance to pressure, and the exhibition of complex structures on fracture. The proportion of these variant fibres seems to depend upon the age of the specimen. There are 18 photomicrographs and 4 diagrams. J.W.D.

Influence of Salts, Pigments, and Preservatives on the Stability of Pigmented Casein Finishes for Leather
Z. Liss

Kožařství, **5**, 65–66 (1955); *Chem. Abs.*, **50**, 11699 (25 Aug. 1956)

The decomposition of the finishes was measured by their decrease in viscosity. The rate of decomposition depends upon the kind of pigment and decreases in the order: Versal Scarlet RNL (I), Versal Yellow 5G (II), Phthalocyanine Blue, Carbon Black, Graftol Bordeaux HB, red iron oxide (no decomposition in 8 months). The binders without pigment did not decompose in 6 months. Decomposition is catalysed by the pigments or by the water-soluble salts they contain. Aqueous extracts of I contained Fe, Ca, Cl, SO_4 and NO_3 ions. A 15% casein soln. containing 1% of *p*-chloro-*m*-cresol showed immediate partial coagulation when treated with 0·25% of $FeCl_3$, $FeSO_4$, $Fe_2(SO_4)_3$, $CaCl_2$ or $Ca(NO_3)_2$, and after 21 days at 40°C. the viscosity dropped to that of water. Additions of I and II free from water soluble salts brought about decomposition at 40°C. in 10 and 24 days respectively. The pigmented finishes can be preserved by using more *p*-chloro-*m*-cresol, more for dilute than for strong casein solutions, the amount needed depending upon the particular pigment. C.O.C.

Formation of Coloured Stains on Leathers and Skins by Micro-organisms
H. Martin

Bull. Assocn. Française Chim. Ind. Cuir, **18**, 175–194 (Aug. 1956)

A full report of studies occupying several years, of the periodic occurrence of stains of various colours on sheepskins tanned in certain regions of France. These stains have been found to be due to the action of certain micro-organisms which may be present on the raw skins, in the tanning liquors, or on the tanned hides. About a dozen such micro-organisms have been isolated and identified. The stains have been reproduced on skins by means of purified cultures of these micro-organisms. J.W.D.

Chemistry of the Tanning of Gelatin
V. A. Veidenbakh

J. Appl. Chem. U.S.S.R., **29**, 918–922 (June 1956)

Sokolov and Fel'dman (*Kolloid. zhur.*, **8**, 368 (1946)) divided tanning agents into two classes—acidoid and basoid—according to the direction in which the isoelectric point of gelatin is displaced during tanning. It is now shown that gelatin tanned with an acidoid agent (HCHO, tannic acid) loses affinity for acid dyes, the affinity for basic dyes being unaffected, whereas tanning with a basoid agent (chrome alum) does not affect the affinity for acid and basic dyes. The application of this criterion to benzoquinone shows that it is a basoid agent. These results indicate that acidoid agents react with the amino groups of gelatin, but, in agreement with Elöd and Schachowsky (*Kolloid-Z.*, **72**, 64, 221 (1935)), basoid agents react not with the carboxyls, but with the hydroxyls, of gelatin. A.E.S.

Hydrazinolysis of Peptides and Proteins. II—Fundamental Studies on the Determination of the Carboxyl Ends of Proteins
S. Akabori, K. Ohno, T. Ikenaka, Y. Okada, H. Hanafusa, I. Haruna, A. Tsugita, K. Sugae, and T. Matsushima

Bull. Chem. Soc. Japan, **29**, 507–518 (June 1956)

Recent Progress in the Chemistry of Peptides
G. W. Kenner

J.C.S., 3689–3700 (Sept. 1956)

PATENT

Plastic having a Rough Surface
Kotitzer Ledertuch- und Wachstuch-Werke *BP* 757,814

Artificial suède leather is produced by coating a flexible support with a layer of liquid containing a hardenable leather-like plastic. In this layer there is then dispersed solid particles. The coating is then hardened and finally treated with a solvent which removes the solid particles but which does not affect the hardened plastic. C.O.C.

Intumescent Fire-retarding Paint with a Protein Base. I—Pyrolysis Curves of Proteins and their Hydrolysates; Pyrolysis Curve of Monosodium Glutamate (VI p. 607)

Configurations of Silk Fibroins and Synthetic Polypeptides VI p. 608)

XIII—RUBBER; RESINS; PLASTICS

Rheology of Surface Films. V—Mechanical Behaviour and Structure of 6-Nylon at Air-Water Interfaces.
K. Inokuchi

Bull. Chem. Soc. Japan, **29**, 490–497 (June 1956)

Films of 6-nylon spread on a water surface have been examined. Electron-microscopical examination of films revealed a structure of microfibrils ca. 40 A. thick. These are transformed to a polyfibrillar layer on compression. The surface pressure measured with this film is intimately related to the surface elasticity of the film. During compression the microfibrils are orientated at right angles to the direction of compression. A.J.

Radiation Chemistry of Polyethylene
R. W. Pearson

Chem. and Ind., 903–904 (1 Sept. 1956)

A reaction mechanism is suggested to account for vinylene unsaturation on irradiation of polyethylene. Gelation and formation of cross-links are accounted for. W.R.M.

PATENTS

Embossing Thermoplastic Sheet
BrC *BP* 758,036

The sheet is supported by its edges so that it faces but does not touch the patterned or irregular surface of an air-permeable fibrous web. It is then heated till it becomes plastic, when air is withdrawn rapidly from between the sheet and the web so that they are drawn into close overall contact. The sheet is cooled while still pressed against the web and when no longer plastic is stripped from it. C.O.C.

Improving the Adhesion of Printing Inks, etc. to Polyethylene
DuP *BP* 758,461

Treatment of polyethylene at $\leq$ 150°C. in an atmosphere containing $\leq$ 0·05% by volume of ozone and preferably in

presence of ultraviolet radiation renders its surface more receptive and more adhesive to printing inks, etc.
C.O.C.

Action of Oil on Rubber Threads (VI p. 608)
Some Isomorphous Copolyamides (VI p. 609)

XIV—ANALYSIS; TESTING; APPARATUS

New Aids for Paper Chromatography
E. von Arx and R. Neher
Helv. Chim. Acta, **39**, 1664–1670 (Oct. 1956)

Simple Alternative to Acetylated Paper for use in Chromatography
P. Harris and F. W. Lindley
Chem. and Ind., 922–923 (8 Sept. 1956)

Paper strips are treated (immersed, drained, and dried quickly) with a 1% soln. in acetone of Seracets (Courtaulds) yarn which has been freed from spinning lubricants by extraction with petroleum ether and, subsequently, dried at 60°C. With this paper and butyl acetate–pyridine–water (1 : 5 : 10) as eluant, phenols, disperse dyes, and certain organic pigments have been successfully separated.
J.W.D.

New Indicator for Titration of Calcium with an (Ethylenedinitrilo)tetra-acetate
J. Patton and W. Reeder
Anal. Chem., **28**, 1026–1028 (June 1956)

A new indicator for use in the titration of calcium with an (ethylenedinitrilo)tetra-acetate (EDTA) has been synthesised. The indicator, 2-hydroxy-1-(2-hydroxy-4-sulpho-1-naphthylazo)-3-naphthoic acid, is obtained by coupling diazotised 1-amino-2-hydroxynaphthalene-4-sulphonic acid with 2-hydroxy-3-naphthoic acid in absence of light (since the diazotised amine is photosensitive). Determination of calcium is possible in presence of magnesium, the presence of which is, in fact, essential for a sharp end-point. The indicator produces a sharp, stable colour change from wine-red to blue. Titration procedures are described for the determination of calcium in water, salt, limestone, and boiler scale. The ammonia–ammonium chloride buffer normally employed in determinations of this type is replaced by an odourless 2-aminoethanol–hydrochloric acid buffer, and the magnesium necessary to ensure a sharp end-point must be added to the buffer in the form of a complex with EDTA. L.T.W.

Pyrocatechol Violet: Indicator for Chelatometric Titrations
V. Suk and M. Malat
Chemist-Analyst, **45**, 30–37 (1956): *Chem. Abs.*, **50**, 10595 (10 Aug. 1956)

Five possible constitutions are discussed and details given for determining Bi, Th, In, Ga, Fe, Ir, Cu, Al, Ti, Ni, Co, Pd, Mn, Zn, Mg and Cd. A highly specific procedure for detecting Zr is given. 37 references.
C.O.C.

Analysis for Small Amounts of Calcium, Magnesium, Barium, and Sulphate using Phthalein Purple
J. R. McCallum
Canadian J. Chem., **34**, 921–925 (July 1956)

Potentiometric Titration of Copper with Dithiooxamide
V. W. Meloche and L. Kalbus
Anal. Chem., **28**, 1047–1049 (June 1956)

A complexometric titration of copper with dithiooxamide is described. Good accuracy is obtained over the range 1–40 p.p.m. Concentrations of 1000 p.p.m. Fe, 400 p.p.m. Co, and 400 p.p.m. Ni do not interfere. L.T.W.

Determination of Microquantities of Copper in Organic Material and Water
N. Chierego
Arch. oceanog. e limol., **10**, (3), 197–199 (1955): *Chem. Abs.*, **50**, 10599 (10 Aug. 1956)

Sodium diethyldithiocarbamate in neutral, alkaline or acid soln. yields a yellow-brown Cu salt which is quite insoluble in water and forms a colloidal suspension. This precipitated Cu salt is extracted in an organic solvent. Interference by Ca and Mg is eliminated by using excess of the carbamate. Fe^{+++} gives an intense brown precipitate in the organic solvent; this is overcome by adding Na_2HPO_4. The colour is then determined colorimetrically in a spectrophotometer.
C.O.C.

Estimation of Cr^{III} in Presence of a Large Excess of Dichromate
D. Monnier and P. Zwahlen
Helv. Chim. Acta, **39**, 1859–1863 (Oct. 1956)

As little as a few μg. of Cr^{III} can be determined in presence of 10–1000 times the amount of Cr^{VI} with an accuracy of $\pm$ 5%. Excess of ceric sulphate is added to the acidified soln., which is heated for 10 min. at 70–80°C., and is then back-titrated potentiometrically with sodium nitrite at 70°C.
H.E.N.

Spectrophotometric Determination of Microquantities of Titanium with 8-Hydroxyquinaldine
K. Motojima
Bull. Chem. Soc. Japan, **29**, 455–458 (June 1956)

3–5 μg. of Ti in ca. 35 ml. of soln. can be determined colorimetrically by measuring the optical density at 380 mμ of the chelation compound formed with 8-hydroxyquinaldine at pH 5–6 and extracted into $CHCl_3$. Traces of Al do not interfere. Fe can be measured simultaneously at 580 mμ.
A.J.

Spectrophotometric Determination of Microquantities of Iron, Titanium, and Aluminium. Use of 8-Hydroxyquinaldine and Oxine
K. Motojima and H. Hashitani
Bull. Chem. Soc. Japan, **29**, 458–460 (June 1956)

When Ti, Al, and Fe are in admixture, Ti and Fe may be extracted with $CHCl_3$ as their chelation compounds with 8-hydroxyquinaldine (see above abstract). This leaves Al alone in the aqueous phase, to be determined in the usual way with oxine.
A.J.

Qualitative and Quantitative Analysis of Mixtures of Surface-active Agents with special reference to Synthetic Detergents
C. Kortland and H. F. Dammers
World Congress on Surface-active Agents, **1**, 137–201 (1954)

Tests are carried out on a sample after removal of inorganic salts by extraction with *iso*propanol. An analytical scheme is given for the determination of ionic type, and a second scheme for the separation of twelve types of anionic detergents.
W.K.R.

Determination of Non-Ionic Detergents in Very Dilute Solutions
H. C. Evans
World Congress on Surface-active Agents, **1**, 202–205 (1954)

A colorimetric method is described for the determination of polyethylene oxide non-ionic detergents in very dilute solution. To 150 ml. of solution (containing up to 15 p.p.m. product and at pH 5·7) add filter aid and 3 ml. of reagent. Stir well and leave overnight. Separate the precipitate by decanting and centrifuging and wash with 0·1% Na_2SO_4, dry at 105°C., dissolve in alcohol, and make up to a known volume. Determine the colour intensity, using a green filter, and compare with a calibration curve obtained with solutions of known concentration. The reagent is prepared by heating to 130°C., with stirring 50 g. resorcinol, 22·5 g. glucose, and 2·5 ml. water. At this temp. 2 mol. of 1:1 (by wt.) H_2SO_4 is added dropwise. After the violent reaction, 100 ml. water is added, and after cooling the solution is diluted to 500 ml. Recalibration is required for each detergent and for each batch of reagent. Anionic detergents must be absent, as even very small quantities interfere.
W.K.R.

Volumetric Determination of the Concentration of Solutions of Ionic Detergents and Dyes by the Bubble-pressure Method
J. M. Preston and S. R. Epton
World Congress on Surface-active Agents, **1**, 310–315 (1954)

In the titration of pure anionic surface-active agents with pure cationics by the bubble-pressure method, the effects of rate of air flow, jet diameter, temperature, hydrostatic head, concentration of reagents, and presence of salts, have been investigated. The end-point closely approaches the theoretical with very dilute solutions, but occurs prematurely with more concentrated solutions. Accuracy is reduced in the presence of salts. Direct titration of anionic dyes with cationic surface-active agents generally gives unsatisfactory results, but by addition of excess cationic and back titration, or by titrating in the presence of a known amount of anionic surface-active agent, reasonably satisfactory results are obtained.
W.K.R.

Continuous Determination and Indication of the Active Material Content of Teepol Solutions
E. Kuyper and D. Vader
World Congress on Surface-active Agents, **1**, 382–385 (1954)

The determination is based on the method of Wijga (*Chem. Weekblad.*, **45**, 477 (1949)), in which the anionic is titrated with cationic in buffered (pH 4·9) Bromocresol Green solution. The colour changes from yellow with excess anionic, through green at the equivalence point, to blue with excess cationic. In the region of the equivalence point, therefore, the anionic can be determined colorimetrically (absorption at 600 mμ.). In the continuous analyser Teepol is automatically metered, diluted, and mixed with an automatically measured amount of reagent (buffered solution of cationic and indicator), and the colour is measured and recorded. The accuracy is ± 1%. W.K.R.

Quantitative Analysis of Quaternary Ammonium Compounds
C. C. T. Chinnick and P. A. Lincoln
World Congress on Surface-active Agents, **1**, 209–214 (1954)

Methods available for the determination of quaternary ammonium compounds (Q) are surveyed critically. The dichromate and ferricyanide precipitation methods are limited to high-mol.wt. ($< C_{14}$) compounds because the solubility of the precipitate increases as the mol.wt. of Q decreases. Gravimetric determination by precipitation with phosphotungstic or phosphomolybdic acids gives accurate results with all Q, but ammonium salts and amines interfere. Of the volumetric methods involving titration against an anionic detergent, the Methylene Blue method gave end-points of 86–114% of theoretical according to the combination of Q and anionic used. With decyl Q no end-point was reached. The Bromophenol Blue method gave accurate results, provided that an anionic of high mol.wt. ($> C_{12}$) was used. With the higher-mol.wt. Q, satisfactory results were obtained with adsorption indicators such as dichlorofluorescein. In the presence of non-ionics, the dichromate and ferricyanide methods are inoperative and the Methylene Blue method gives somewhat lower results, but satisfactory results can be obtained by a slightly modified Bromophenol Blue titration. With mixtures of Q and non-ionics, total surface-active agent is obtained by precipitation with phosphotungstic acid, and Q by the Bromophenol Blue method. W.K.R.

Chromatography of Naphthalenesulphonic Acids
G. Spencer and V. Nield
Chem. and Ind., 922 (8 Sept. 1956)

Naphthalene-mono-, di-, and tri-sulphonic acids may be separated by ascending paper chromatography using *tert.*-butanol–*n*-butanol–water (40 : 30 : 30), and the zones may be readily located by means of a quartz ultraviolet lamp (a glass-enveloped lamp will not serve the purpose). The acids have well defined absorption bands in the 270–290 mμ. region, and this might well form the basis for a quick, simple, and accurate method for their separate determination. J.W.D.

New Complexing Agents. II—Pararosanilinehexa-acetic Acid (*NNN'N'N''N''*-Hexakiscarboxymethyl-pararosaniline)
R. P. Lastovskiĭ, Yu. I. Vaĭnshteĭn, N. M. Dyatlova, and V. Ya. Temkina
J. Anal Chem. U.S.S.R., **11**, 405–409 (July–Aug. 1956)

The title cpd. (I) is synthesised, its acid–base indicator properties are examined, and its complexing properties in soln. of pH ranging from 2·5 to 12·4 are determined by polarography in presence of various metal cations. Many of these, e.g. Cu^{2+}, Fe^{2+}, Sn^{2+}, Pb^{2+}, form sol. stable complexes, and the polarographic wave characteristic of the ion is displaced or eliminated over defined ranges of pH. Unlike other complexing agents, I eliminates the reduction wave of Cu^{2+} even at pH 2·5. A.E.S.

Artificial Dyes in Foods and Identification of Dyes by Paper Chromatography. I—Wines, Vermouths, Apéritifs, Syrups, and Mineral Waters
J. Deshusses and P. Desbaumes
Mitt. Lebensm. Hyg., **47**, 15–19 (1956): *Chem. Abs.*, **50**, 12341 (10 Sept. 1956)

The dyes are absorbed on wool, eluted from the wool with 2% NH_4OH in the cold, purified and then separated and identified by paper chromatography. The method is applicable for detecting 0·5 mg. of dye in 1 litre of liquid. C.O.C.

Detection and Determination of Colouring Materials in Butter and Margarine
H. M. Espoy and H. M. Barnett
Food Technol., **9**, 367–372 (1955): *Chem. Abs.*, **50**, 12323 (10 Sept. 1956)

The absorption curves of bixin, β-carotene and the coal tar dyes Yellow OB and Yellow AB were determined. Mixtures of Carotene, Annatto Extract and coal tar dyes were separated and analysed individually without the necessity of saponifying the oil carrier. Carotene and Annatto were determined by chromatographic separation with MgO and Johns-Manville Hi-Flo Super Cel for the former and Na_2CO_3 and Hi-Flo Super Cel for the latter. The certified dyes were separated by means of an acid-extraction procedure and the percentage of coal tar dye determined by the extraction coefficient at 585 mμ. Analysis of butter indicated that coal tar dyes were the most commonly used colouring materials. C.O.C.

Determination of Chalcones
W. Davey and J. R. Gwilt
Chem. and Ind., 911–912 (8 Sept. 1956)

Chalcone (benzylideneacetophenone) and its derivatives are determined, with 95–100% recovery, by the formation of their 2:4-dinitrophenylhydrazones under specified conditions. With certain aminochalcones there appears to be a tendency for amine salt formation under the conditions of the reaction; this leads to low results. J.W.D.

Light Scattering and Tinting Strength of the White Pigments
W. Jaenicke
Z. Elektrochem., **60**, 163–174 (1956)

Maximum tinting strength of a pigment is related to an optimum particle size by $d = 0{\cdot}9\pi\lambda/n_0 \times (m^2+2)/(m^2-1)$ ($m = n/n_0$ is the ratio of the refractive indices of the pigment and of the medium). With linseed oil as medium and $\lambda = 0{\cdot}55\mu$, optimum particle sizes are: $BaSO_4$ 1·28, white lead 0·5, ZnO 0·47, ZnSO 0·30, anatase 0·27, and rutile 0·23. By measuring the tinting strength of ZnS particles of known average diameter an empirical correction is introduced into the scattering function. The corrected formula of the specific re-emission constant for diffuse illumination is in good agreement with the experimental results. The influence of pigment concentration in the binder, particle size distribution, and particle shape, are discussed in relation to the optical effect. C.O.C.

Test for Cross-linking of Linear Polymers
G. Thomson
Nature, **178**, 807 (13 Oct. 1956)

A simple chromatographic test for detection of cross-linked polymers in varnishes. W.R.M.

Work of Alois Herzog
P.-A. Koch
Z. ges. Textilind., **58**, 678–682 (5 Sept. 1956)

References to 204 papers are given, mainly dealing with textile microscopy. C.J.W.H.

Definition and Measurement of Crimp of Textile Fibres
E. Alexander, M. Lewin, H. V. Muhsam, and M. Shiloh
Text. Research J., **26**, 606–617 (Aug. 1956)

Determination of Traces of Manganese in Textiles by means of Formaldoxime
A. G. Hamlin
J. Textile Inst., **47**, T 445–T 452 (Aug. 1956)

Formaldoxime develops a red–brown colour with bivalent manganese in alkaline solution, and as a means of estimating manganese this is five times as sensitive as the method based on the oxidation of manganese to permanganic acid. A study is made of the effect of other ions and of means for their removal, and a detailed description of the somewhat complex method is given. J.W.B.

Impregnation and Embedding of Cellulose Fibres for Electron Microscopy
S. Asunmaa
Svensk Papperstidning, **54**, 527–530 (15 Aug. 1956)

The fibres are moistened and impregnated in the swollen state with a solution of silver nitrate, phosphotungstic acid, sodium tungstate, or osmium tetroxide. The metal diffuses into the fibre wall in the direction of the fibre axis and is reduced with quinol. After drying, the fibres are pretreated with dried benzene to allow the embedding medium, *n*-butyl methacrylate, to penetrate uniformly

into the fibres. Polymerisation of the methacrylate is carried out by the usual method. The morphologically accessible regions of the swollen fibres are defined by the metallic layers. Electron micrographs of fibre sections are appended. K.W.

The Accelerotor—for Abrasion Testing and Other Purposes
H. W. Stiegler, H. E. Glidden, G. J. Mandikos, and G. R. Thompson

Amer. Dyestuff Rep., **45**, P 685–P 700 (10 Sept. 1956)

The Accelerotor is an instrument for subjecting textiles and other flexible materials to rapid and violent mechanical action, attained by placing test samples in a chamber within which rotors or impellers of special design, and of variable surface, revolve at high speed. The various types of abrasion and flexing achieve within a few minutes results which are closely related to more conventional full-scale tests, e.g. in a laundering machine. The apparatus can also be used to assess felting shrinkage or colour fastness to washing. Abraded fragments can be collected for examination. A large number of photographs and photomicrographs are shown to illustrate the types of testing possible. J.W.B.

Separation and Examination of Fibre Blends
F. W. Lindley

J.S.D.C., **72**, 469–472 (Oct. 1956)

A flotation method of wide applicability for the separation of fibre blends has been developed. The method has been used for quantitative separations and in the examination of blends where information about the physical or chemical properties of the component fibres was required. AUTHOR

Determination of Cotton in Mixtures with Viscose Rayon by means of Sulphuric Acid
E. Druce

J. Textile Inst., **47**, T 430–T 438 (Aug. 1956)

When viscose rayon is treated with cold 60% H_2SO_4 it does not always dissolve. If it is twisted, e.g. spun yarn, there is a tendency for a gelatinous shield to form which resists full penetration of the acid, even if very short lengths of yarn are employed. Dissolution can be brought about by first shaking the sample with water in an end-to-end shaker (0·25 g. yarn to 30 ml. water) and then drying the flask at 85–95°C.: this treatment opens up the yarn. The effect of varying H_2SO_4 concn. is also studied, and a value of 59±0·25% is considered best: the loss of non-cellulosic material from cotton is less and, moreover, the solubility of cotton is less affected by a change in acid concn. in the neighbourhood of 59% than by the same change around 60%. No difference is caused by temperature fluctuations over 15–25°C., and a time of 30 min. appears adequate. A table of correction factors for different cottons and cottons processed in different ways is given, followed by a detailed description of the revised analytical method. J.W.B.

Influence of Structural Disturbances at the Cut Ends in the Willows–Alexander Reaction
K. Schwertassek

Faserforsch. und Textiltech., **7**, 477–479 (Oct. 1956)

The formation of amorphous cellulose at cut ends of cellulosic fibres unfavourably affects the Willows–Alexander reaction. By moistening fibre preparations and drying over a gas flame the amorphous cellulose is caused to recrystallise at the cut ends, and the sensitivity of the Willows–Alexander reaction is increased. W.R.M.

Determination of the Structure of Textiles
K. Schwertassek

Textil Praxis, **11**, 762–767 (Aug. 1956)

A discussion of methods of determining the structure of textile fibres with special reference to the use of the iodine absorption method for cellulosic and polyamide fibres. B.K.

Determination of the Total Sulphur Content of Viscose
K. Flégr and W. Berndt

Faserforsch. und Textiltech., **7**, 397–401 (Sept. 1956)

Methods of determination of sulphur in viscose are examined, and a new method is described in which sulphur compounds are oxidised to sulphate with hydrogen peroxide, and the sulphate is precipitated with barium chloride and titrated indirectly with Complexone III. W.R.M.

Quantitative Analysis of Unions of Wool and Regenerated Cellulosic Fibres
E. Frieser

Textil Praxis, **11**, 755–760 (Aug. 1956)

A record of experiments on the quantitative analysis of unions of wool with viscose or cuprammonium rayon using sulphuric acid, sodium hydroxide, potassium hydroxide, and the modified formic acid–zinc chloride processes. B.K.

Mixtures of Wool and Artificial Fibres
H. Zahn and E. Kratzsch

I—Determination of Wool in Mixtures of Wool, Viscose Rayon, and Cuprammonium Rayon

Melliand Textilber., **37**, 75–80 (Jan. 1956)

Methods for the determination of wool in mixtures with viscose and cuprammonium rayons based upon the potassium hydroxide, Heermann's sulphuric acid, and Viertel's aluminium chloride methods are discussed. Determinations have been carried out both on prepared and on industrial samples. The reproducibility of the methods and attack on the residual fibres are compared. It is shown that the caustic potash method is superior to the sulphuric acid method. H.K.

II—Determination of Wool in Mixture Yarns of Wool, Polyamide, Polyacrylonitrile, and Polyester Fibres

Ibid., 177–184 (Feb. 1956)

Practical methods for the determination of the wool content, using potassium hydroxide, formic acid, dimethylformamide, and Resolvan NK (BASF), are described and critically discussed. The KOH method is chosen as the one for general use. Correction factors for attack on residual fibres and for humidity differentials can be obtained graphically. H.K.

Chamber Size and R_f Values of Amino Acids
R. A. Clayton

Anal. Chem., **28**, 904–906 (May 1956)

The vol. of solvent necessary to saturate a specific chamber under a given set of experimental conditions is termed the "critical volume" (C.V.). When the amount of developing solvent used exceeds the C.V., the R_f values will be constant and at a min. Below the C.V. the values will be at a constant max. It is suggested that C.V.s should be notified in future communications. J.W.D.

Modified Ultraviolet Spectrophotometric Micromethod for Determination of Amino Acids and Peptides as Copper Complexes
A. Cherkin, H. Wolkowitz, and M. S. Dunn

Anal. Chem., **28**, 895–896 (May 1956)

The usefulness of the method due to Spies (*J. Biol. Chem.*, **195**, 65 (1952)) for determining amino acids and peptides is confirmed. The method has been simplified, the blank value has been reduced by ca. two-thirds, and the accuracy with samples of < 1 micromole has been increased. Data relating to 21 amino acids are tabulated. J.W.D.

Fluorometric Micromethod for Determination of Tryptophan
G. D. Miller, J. A. Johnson, and B. S. Miller

Anal. Chem., **28**, 884–887 (May 1956)

The determination of micro quantities of tryptophan (I) is effected by first separating it from other amino acids on a column of Dowex 50 (Na form), and then causing it to react with glucose under optimal standard conditions; these latter include the heating of 20 μg. or less of I with 0·8 g. of glucose at pH 1·38 and 118°C. for 4 hr. There is a linear relationship between concn. and fluorescence intensity (read at pH 1·80). The standard error is ±3% for 12 μg. of I. J.W.D.

Colorimetric Determination of Hydroxyproline
D. S. Miyada and A. L. Tappel

Anal. Chem., **28**, 909–910 (May 1956)

A critical study resulting in the modification of the method of Neuman and Logan (*J. Biol. Chem.*, **184**, 299 (1950)). The application is reported of the method to the determination of hydroxyproline in gelatin and collagen; the results obtained compare well with the reported values given by other methods. There is some interference from tyrosine and tryptophan when these are present in appreciable amounts. J.W.D.

Colorimetric Determination of Tryptophan in Wool
G. Mazingue, G. Decroix, and M. van Overbèke
Bull. Inst. Text. France, (61), 37–46 (June 1956)

Tryptophan is determined by means of the blue coloration produced when wool is slowly hydrolysed with conc. hydrochloric acid in the presence of *p*-dimethylaminobenzaldehyde. The value obtained for the tryptophan content of wool, 0·53%, is considerably lower than that reported by other workers. It is found that the initial rate of colour development is greater for wools which have been degraded under oxidising conditions than for untreated controls. A possible method of rapidly detecting damage due to oxidation is thus envisaged (see following abstract). J.C.F.

p-Dimethylaminobenzaldehyde Test for Detecting Damage in Wool due to Oxidation
G. Decroix, G. Mazingue, and M. van Overbèke
Bull. Inst. Text. France, (61), 47–54 (June 1956)

0·5 g. of conditioned sample is immersed in 50 ml. of conc. hydrochloric acid. After 2 min. 2 ml. of a soln. of 5 g. of *p*-dimethylaminobenzaldehyde in 10 ml. of 10% H_2SO_4 is added. After stirring for 2 min. the sample is withdrawn, rinsed, dried, and allowed to condition. The degree of staining produced, which is greater for oxidised than for untreated wools, is estimated colorimetrically. As a test for oxidative degradation, the present method is more selective than the Pauly test. J.C.F.

Spectrophotometric Method for the Determination of Cysteine and Related Compounds
Y. Avi-Dor and J. Mager
J. Biol. Chem., **222**, 249–258 (Sept. 1956)

The reaction between certain thiol compounds and fluoropyruvic acid leads to the formation of compounds exhibiting a characteristic spectrum in the ultraviolet zone with a peak in the wavelength region between 265–275 mμ. With thiols possessing an unsubstituted amino group in the α- or β-position in relation to the thiol group, the peak is shifted to 300 mμ. and the molecular extinction increases nearly ten times. A spectrophotometric method based on the above phenomenon, suitable for the determination of cysteine and related compounds, is described. P.G.M.

Stiffness Estimation
H. G. Fröhlich
Z. ges. Textilindustrie, **58**, 719–720 (20 Sept. 1956)

The estimation of the stiffness of various qualities of hat felts is described. B.K.

Polymer Characterisation
R. G. Beaman and F. B. Cramer
J. Polymer Sci., **21**, 223–235 (Aug. 1956)

A characterisation scheme for small-scale evaluation of fibre-forming polymers is given. Tests are described for bulk polymer, fibres, and films. The copolymer system poly(tetramethyleneadipamide – co - hexamethylenesebacamide) was evaluated over the whole composition range. In general, maxima or minima were obtained at an intermediate composition for many properties studied. Water absorption and glass temperature seem, however, to be more linearly related to composition. W.R.M.

Glycollic Titrations. III— Titration of Organic Bases and Polyamides in Glycol–Phenol Medium
R. S. Palit and U. N. Singh
J. Indian Chem. Soc., **33**, 507–512 (July 1956)

In the titration of organic bases with acid, in an ethylene glycol–phenol medium (I), the phenol lowers the neutralisation pH and enhances the sharpness of the end-point; this is due to its protogenic character. Studies in the titration of pyridine (II) and aniline (III) in I show that $HClO_4$ is, in phenol, a much stronger acid than HCl. The following pairs of bases can be successfully and precisely titrated differentially in I: (i) diethylamine and II; (ii) triethylamine and II; and (iii) ammonia and II. The differential titration of III in presence of any alkylamine is possible. Mixtures of two alkylamines, or of II and III, cannot be so titrated. Sodium acetate cannot be differentially titrated from any organic base in such a medium. Titrations can be carried out using ordinary glass electrodes and they are highly reproducible. Water up to 5% concn. is without adverse effect. The end-point may be judged potentiometrically or with visual indicators. Nylon dissolved in I has been successfully titrated with HCl using Thymol Blue as visual indicator. The value for mol.wt. obtained by this method is of the correct order of magnitude. J.W.D.

Determination of Dimensional Changes in Textiles on Wetting Out and Washing
Deutscher Normenausschuss
DIN 53892
Textil Praxis, **11**, 907–910 (Sept. 1956)

Draft standard methods are described. B.K.

Classification of Evaluation Tests for Detergent Products
C. Pugh and S. R. Epton
World Congress on Surface-active Agents, **1**, 252–259 (1954)

Methods for evaluating the performance of detergents are classified according to their ability to predict consumer reaction. At different levels of efficiency are consumer surveys, practical tests, laboratory screening tests, and the measurement of chemical and physical properties. The interrelation of tests at different levels is discussed and is illustrated by the development of tests for detergents used in dishwashing. W.K.R.

Practical Tests for Evaluation of Detergency
J. A. Keene and R. S. Airs
World Congress on Surface-active Agents, **1**, 241–246 (1954)

The evaluation of detergent processes by practical washing tests, involving the repeated washing of naturally soiled collars and mixed domestic laundry work, is described. Results illustrate the difference in efficiency of various builders and the value of carboxymethylcellulose in whiteness retention. W.K.R.

Scope of a Launderometer Test for the Evaluation of Cotton Detergency
C. Kortland, A. Hughes, J. A. Keene, H. H. Zwilling, and P. L. Kooijman
World Congress on Surface-active Agents, **1**, 260–266 (1954)

Launderometer tests with artificially soiled patterns provide sufficient discrimination between good and poor products, high precision, and reasonable correlation with practical tests to justify their use in screening. Results, however, should always be confirmed by a practical wash test. In some cases, Launderometer tests can give misleading results; e.g. the effect of carboxymethylcellulose is exaggerated, and results are oversensitive to the concentration of sodium ions in the liquor. W.K.R.

Evaluation of the Mechanical Efficiency of Washing Methods
S. V. Vaeck, A. van Nuffel, and G. Wouters-Vanlook,
Teintex, **21**, 605–633 (Aug. 1956)

The influence of mechanical agitation on soil removal was studied on four standard soiled test fabrics in an industrial machine carrying a normal load of lightly soiled whites and in a Launderometer with 50 steel balls per container in order to reach an agitation comparable with practice. At a given level of agitation, the soil removal in both machines obeys the Bacon–Smith law—log (concn. of soil in fabric) varies inversely with log (washing time) in a single wash, or with log (No. of washes) for a multiple treatment. The law does not hold for the first few minutes of washing, during which period the intensity of agitation plays an important part. After 5 min. this factor ceases to exert much influence. S.R.C.

Analysis of Hypochlorites and Chlorites in Solution
I. E. Flis and M. K. Bŷnyaeva
J. Anal. Chem. U.S.S.R., **11**, 453–458 (July–Aug. 1956)

Hypochlorite–chlorite mixtures can be analysed by determining ClO^- quantitatively by potentiometric titration with arsenious acid in an alkaline medium (pH > 9) and determining $ClO^- + ClO_2^-$ by iodometric titration. A.E.S.

Photoelectric Measurement of Whiteness with Selenium Cells
T. Weber
Textil-Rund., **11**, 594–596 (Oct. 1956)

The linearity of the galvanometer characteristic is extended further with increasing intensity of illumination if the internal resistance of the instrument is low. The linearity depends also on the distance between the source and the specimen. These variations largely account for the different readings given by different instruments. S.R.C.

Simple Adapter for the Determination of Absorption Spectra on Small Volumes of Solution
D. Green and C. J. Timmons
Chem. and Ind., 1139–1140 (20 Oct. 1956)

Conventional techniques of absorption spectroscopy in the ultraviolet and visible regions require soln. vol. of 0·5 ml. and upwards, but by use of modern photoelectric spectrophotometers and by ensuring that almost all the sample is in the light beam, it is now shown that much smaller vol. (e.g. 0·13 ml.) may be used. An inexpensive adapter is described which achieves this result with standard absorption cells, and without necessitating any alteration to the spectrometer or cell compartment. The cells stand on platforms inside the usual cell holder, so that the bottoms of the cells are raised nearly to the centre of the incident light beam. A small mark fixed into the platform defines the bottom of the transmitted light beam, the top of which is limited by a larger mark, thus enabling a much reduced vol. of soln. to fill the resulting 4 mm.-high light path. Diagrams are included. The measurements recorded were made with a Unicam S.P.500 spectrophotometer. H.H.H.

Instrumentation, an Integral Part of Dyeing and Finishing
W. Ridley
Amer. Dyestuff Rep., 45, P 551–P 555 (13 Aug. 1956)
A brief survey. J.W.B.

Early Work on Fixing Standards for Light Fastness
Society of Dyers and Colourists Fastness Tests Co-ordinating Committee
J.S.D.C., 72, 431–433 (Sept. 1956)

Portions are reproduced of the first (1934) of the Society's reports on fastness tests, relating to the fixing of standards for light fastness. AUTHOR

Xenotest Light Fastness Tester
Anon.
Dyer, 115, 613–615 (13 April 1956)

A description of the Cassella fading lamp (manufactured by Quarzlampen G.m.b.H., Hanau, Germany), which is a high-pressure xenon radiator having a spectrum very similar to sunlight in the visible (400–700 mμ.) and ultraviolet (300–400 mμ.) range. The xenon radiator is surrounded by a double-walled cylinder of filter glass, which limits ultraviolet radiation light at 295 mμ. and which is kept cool by water circulating between the walls; a strong current of cold air maintains a low temp. between radiator and cylinder. The sample-holders rotate at 5 r.p.m. and are turned 180° after each revolution. The "working life" of the radiator is the time in which the light radiation does not decrease by more than 25% of the original, and it has recently been increased from 800 to 1400 hr. Precipitation of $CaCO_3$ and Fe from the cooling water on the walls of the filter cylinder can influence the spectral distribution of the radiator, and therefore occasional cleaning must be carried out. A.H.

Testing Fastness to Light and Weather
F. I. Sadov and E. S. Shatrova
Nauch. Issledovatel. Trudy Moskov. Tekstil. Inst., 13, 32–46 (1954):
Referat. Zhur., Fiz. No. 12545 (1955):
Chem. Abs., 50, 11019 (10 Aug. 1956)

An exposure apparatus constructed in 1941 consists of a metal cylinder 600 mm. in diameter and 1100 mm. high, provided with quartz mercury lamps, a water jacket for controlling temperature, and means for conditioning and circulating the air inside it. C.O.C.

Fastness-to-rubbing Tester
F. Ruf
Textil-Rund., 11, 609–610 (Oct. 1956)

An automatic apparatus giving good reproducibility, independent of the operator, rubs white against dyed material, under pressure controlled by an air-pump, counting the number of backward and forward strokes (illustrated). S.R.C.

Gas Fading of Disperse Dyes on Cellulose Acetate Fabrics
A. Greyborn
Canadian Textile J., 73, 46–48 (13 July 1956)

After a brief survey of the cause and effect of gas fading a description is given of a device for testing colour fastness to this agency. The cylindrical apparatus described has a Plexiglas upper chamber attached to a lower stainless steel cylinder inside which is placed a beaker containing H_2SO_4 and $NaNO_2$. Also in the bottom half is an electric motor, which drives a turntable on which the patterns are mounted and which also has mounted on it stainless steel fan blades to propel the oxides of nitrogen upwards on to the samples. A.H.

Flammability of Apparel, Household, and Furnishing Textile Fabrics— Method of Test
Tentative Textile Standard No. 40 (1956)
J. Textile Inst., 47, P 799–P 806 (Sept. 1956)

Summary of Work of the Flammability Testing Panel
Textile Institute
J. Textile Inst., 47, P 807–P 816 (Sept. 1956)

Wash-and-wear Cottons
C. R. Williams
Amer. Dyestuff Rep., 45, P 472–P 478 (16 July 1956)

A representative sampling of commercial cotton fabrics is analysed for a large number of physical properties, and given a subjective "wash-and-wear" rating. No physical property is found to correlate with the rating, though if printed fabrics of extreme colour and pattern are eliminated a significant linear relation with wrinkle recovery is evident. Following trials which established a direct relation between wet and dry wrinkle recovery, work was confined to dry tests. It is shown that wrinkle recovery alone is the mechanism whereby a resin improves wash-and-wear properties, resinification being detrimental. This indicates that the cyclic dimethylolethyleneurea type is best. Suitable distracting patterns and colours increase the rating by drawing attention away from wrinkling and creasing, though resin treatments are always necessary. It is considered that the addition of materials other than thermosetting resin and catalyst should be kept to a minimum as far as wash-and-wear properties are concerned. J.W.B.

Wash-and-wear Fabrics
E. W. Lawrence and R. H. Phillips
Amer. Dyestuff Rep., 45, P 548–P 550, P 560 (13 Aug. 1956)

It is suggested that a wash-and-wear fabric is one which, when washed by normal domestic procedure, dries sufficiently smooth and free from wrinkles to allow it to be worn or used without ironing or pressing. A subjective method of evaluation is shown to correlate well with crease-recovery values. For optimum characteristics, fabrics should have 240° crease recovery, as measured by the Monsanto tester, after 5 domestic launderings. Crease recovery alone cannot be relied upon, and fabrics should be checked by a washing procedure. J.W.B.

Use of Colouring Matters for Control of Urea-Formaldehyde Finishes
F. C. Mauri
Ingeniería Textil, 22, (112), (Jan.–Feb. 1955):
Tintorería industrial, (18), 407–415 (Aug. 1956)

Irregularities of expression, migration, etc. can be revealed by subsequent dyeing. Different loadings of resin are revealed by dyeing with dyes having affinity for the cellulose (3-g. patterns in 50:1 liquor containing 0·3 g. dye— Solar Blue G (S) or Solar Flavine R (S) for 10 min. at 60°C. and rinsing in running water. Dyeings on a range of patterns treated with Finish EN (S) are illustrated. Dyes with affinity for the resin, e.g. Alizarin Light Blue B (S), Brilliant Sulphon Red B (S), and Sulphonine Scarlet GWL (S), may conversely be used to reveal differences in D.P. S.R.C.

Condensates for Resin Finishing. XVIII–XX— Method of Detecting the Optimum Baking Time on Resin-treated Fabrics (III–V)
H. Sobue, Y. T. Chi, and K. Murakami
J. Soc. Textile Cellulose Ind. Japan, 12, 487–490 (July 1956)

III— The authors attempted to detect the optimum baking time by measuring the shrinkage and the swelling of fabrics. Results obtained from the preceding studies (XVI and XVII) are presented.

Ibid., 490–494 (July 1956)

IV— The effects of changed curing temperatures were studied, and the six properties of treated fabrics previously mentioned were measured. The mechanism of intermicellar finishing of fabrics is considered.

Ibid., 589–591 (Aug. 1956)

V— Measurement of the degree of swelling of resin-treated fabrics is more accurate than the other four methods. The paper deals with the intrinsic mechanism of resin-treatment. AUTHORS

Determination of Calcium in Cellulose with Ethylenediaminetetra-acetic Acid
L. Sjölin

Svensk Papperstidning, **59**, 623–628 (30 Sept. 1956)

The Swedish standard method CCA 19 has been simplified by taking 10 g. of pulp instead of 100–150 g., whereby difficulties on incineration are avoided, and by determining the Ca content of the ash dissolved in HCl by direct titration with E.D.T.A., using murexide as indicator, instead of pptn. with oxalate and titration with $KMnO_4$. Comparative laboratory tests confirmed the suitability of the simplified method. Experiments have also been carried out to speed up the analysis by omitting the incineration and treating the pulp directly with E.D.T.A. This procedure, however, is not suitable for carrying out parallel tests. K.W.

Determination of Dialdehyde Units in Periodate-oxidised Maize Starch
J. C. Rankin and C. L. Mehltretter

Anal. Chem., **28**, 1012–1014 (June 1956)

The extent of oxidation of maize starch by sodium periodate is determined by two methods— (1) carbonyl groups are reduced to alcohol groups with sodium borohydride; (2) unchanged anhydroglucose units are oxidised with sodium periodate, and untreated starch is similarly oxidised as a control, the dialdehyde content being found from the difference in the amounts of periodate required. The results of the two methods agree closely and are in accord with the observed periodate consumption in the preparation of the oxidised starches. L.T.W.

Determination of Pentosans. II— Use of Barbituric Acid for Determination of Furfural
P. O. Bethge and R.-M. Persson

Svensk Papperstidning, **59**, 535–539 (15 Aug. 1956)

The reaction of furfural with barbituric acid is slow and is influenced by several factors such as temperature, furfural concn., excess of barbituric acid, and impurities that may be present in barbituric acid. Hydroxymethylfurfural (HMF) is not pptd. by barbituric acid but is co-pptd. if furfural is present. Yields are low at low furfural concn. and are further lowered if HMF is present. Barbituric acid may be used for the determination of pentosans only if the reaction conditions are carefully controlled. K.W.

Polarographic Determination of Methyl Methacrylate Monomer in Polymers
R. J. Lacoste, I. Rosenthal, and C. H. Schmittinger

Anal. Chem., **28**, 983–985 (June 1956)

Colorimetric Determination of Alkylidenediphenol-type Epoxy Resins and their Fatty-acid Esters
M. H. Swann and G. G. Esposito

Anal. Chem., **28**, 1006–1007 (June 1956)

Marquis reagent (a mixture of aqueous formaldehyde and conc. sulphuric acid) gives an intense blue colour with epoxy resins, due to interaction with the etherified alkylidenediphenol groups. By modifying the reagent (using paraformaldehyde instead of aqueous formaldehyde) a quantitative colorimetric method for the determination of epoxy resins has been devised. The method is applicable to unmodified and esterified resins and also to blends with silicones. The blue colour obtained is specific; its intensity is independent of molecular weight, and hence no knowledge of polymer length is required. L.T.W.

PATENT

Abrasion-testing Machine for Fabrics
Custom Scientific Instruments *USP* 2,721,473

Reactions of Disodium Pentacyanoamminoferrate with Aromatic Amines. I— Preparation and Properties of Compounds containing the Pentacyano-*p*-hydroxyanilineferrate Ion (IV p. 593)
p-Ethoxychrysoidine as Acid–Base Indicator and Oxidation-Reduction Indicator (IV p. 595)
Application of Ultramicrotomy to the Study of the Fine Structure of Viscose Rayon Fibres (VI p. 606)
Relation between the Softness of Handle of Wool in the Greasy and Scoured States and its Physical Characteristics (VI p. 607)
Fading of Dyeings in Inclement Weather (VIII p. 611)
Diffusion Measurements in Polyamide Fibres (VIII p. 612)
Behaviour of Formaldehyde-sulphoxylate in Vat Printing (IX p. 612)
Distribution of Resin during Resin Finishing of Fabrics (X p. 614)
Hydrazinolysis of Peptides and Proteins. II— Fundamental Studies on the Determination of the Carboxyl Ends of Proteins (XII p. 618)

XV—MISCELLANEOUS

Studies on Oxy-acid Phosphors. V— Stannate Phosphors (I)
Y. Kotera, T. Sekine, and M. Yonemura

Bull. Chem. Soc. Japan, **29**, 616–619 (July 1956)

Stannate phosphors, activated by the metals listed, emit light of the following colours: (i) manganese— green, blue, or yellowish-white; (ii) bismuth— blue, violet, or red; (iii) lead— orange, green, or blue; and (iv) cerium— blue or red. A.J.

Bleaching of Visual Purple in Solutions of Inorganic Salts
C. D. B. Bridges

Nature, **198**, 860–861 (20 Oct. 1956)

It has been stated that visual purple can be salted out of aq. soln. with magnesium and sodium sulphates. In attempts to repeat these observations with moderately conc. soln. no precipitation occurred, but the bleaching of the visual purple was modified in the presence of large amounts of ammonium sulphate or chloride, and of magnesium or sodium sulphate. On exposure to light, such soln. bleached to a stable orange photoproduct, which was not indicator yellow, and was probably meta-rhodopsin; in darkness at 20°c., transformation to indicator yellow occurred during 48 hr. Heating for 15 min. at 60°c. destroyed the orange cpd. with formation of a pale yellow gel. H.H.H.

Clathrate Compounds
H. M. Powell

Rec. Trav. chim., **75**, 885–890 (June 1956)

Flocculation at Sedimentation. I— Two-particle Interaction
O. Andersson

Svensk Papperstidning, **59**, 540–545 (15 Aug. 1956)

Attractive forces between particles will be large enough to cause aggregation only if the distance between the particles decreases sufficiently as a result of their relative motion. Relative displacements occur on sedimentation at different particle velocities. Repulsive forces also arise owing to hydrodynamic interaction between particles. The deviation from the vertical path on sedimentation by interaction of two particles is derived from fundamental hydrodynamic equations, and it appears that spherical particles will never touch one another during sedimentation. The validity of the equations was tested by recording the motion of pairs of glass balls in glycerol. K.W.

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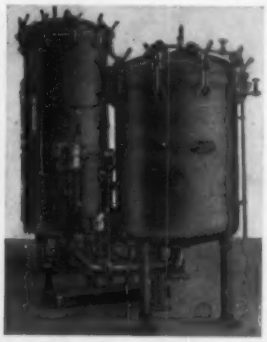

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FORTHCOMING MEETINGS OF THE SOCIETY—*continued from page* x

Thursday, 7th March 1957

BRADFORD JUNIOR BRANCH. *Flame Proofing.* J. R. W. Perfect, Esq. (Bradford Dyers' Association Ltd.). Technical College, **Bradford.** 7.15 p.m.

Friday, 8th March 1957

LONDON SECTION. *Soiling of Natural and Synthetic Fibres.* G. G. Taylor, Esq., B.Sc., A.Inst.P. (Clayton Dyestuffs Co. Ltd.). Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 12th March 1957

SCOTTISH SECTION. *Recent Developments in Wool Dyeing.* G. H. Lister, Esq., Ph.D., B.Sc. (Sandoz Products Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Wednesday, 13th March 1957

NORTHERN IRELAND SECTION. *Problems in Wet Processing of Rayon Blends.* H. D. Edwards, Esq., Ph.D., A.R.I.C. and R. C. Cheetham, Esq., A.M.C.T., F.R.I.C. (Courtaulds Ltd.). Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

Thursday, 14th March 1957

WEST RIDING SECTION. *The Dyeing of Acrylic Fibres.* K. Meldrum, Esq., B.Sc., A.R.I.C. (Courtaulds Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 19th March 1957

HUDDERSFIELD SECTION. Annual General Meeting. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 20th March 1957

MIDLANDS SECTION. *Developments in Sizing as they affect the Dyer and Finisher.* J. H. MacGregor, Esq., Ph.D., F.R.I.C., and E. France, Esq., A.R.C.S., A.M.C.T. (Joint with the British Association of Chemists.) Midland Hotel, **Derby.** 7 p.m.

Friday, 22nd March 1957

BRADFORD JUNIOR BRANCH. Annual Dance. Connaught Rooms, **Bradford.**

Saturday, 23rd March 1957

NORTHERN IRELAND SECTION. Annual General Meeting and Dinner. Woodbourne House Hotel, **Belfast.** Details later.

Thursday, 28th March 1957

MIDLANDS SECTION. *The Soiling of Natural and Synthetic Fibres.* G. G. Taylor, Esq., B.Sc., A.Inst.P. (Joint with the Textile Institute.) Carpet Trades Canteen, **Kidderminster.** 7.30 p.m.

WEST RIDING SECTION. Annual General Meeting. Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 29th March 1957

The Society's Annual Dinner. The Grosvenor House, Park Lane, **London.**

Friday, 5th April 1957

LONDON SECTION. *Some Aspects of Bleaching with Hydrogen Peroxide and Peracetic Acid.* L. Chesner, Esq., B.Sc., A.T.I. and G. C. Woodford, Esq. (Laporte Chemicals Ltd.). George Hotel, **Luton.** 7 p.m.

Tuesday, 9th April 1957

SCOTTISH SECTION. Annual General Meeting. 7 p.m. Followed by ordinary Meeting at 7.30 p.m. *Developments in Sizing as they Affect the Dyer and Finisher.* J. H. McGregor, Esq., Ph.D., F.R.I.C. and E. France, Esq., A.R.C.S., A.M.C.T. (Courtaulds Ltd.). St. Enoch Hotel, **Glasgow.**

Friday, 12th April 1957

MIDLANDS SECTION. Annual Dinner. George Hotel, **Nottingham.** 7 p.m.

Wednesday, 17th April 1957

MIDLANDS SECTION. . . . . *and inwardly digest (a Dissertation on Technical Literature).* S. Burgess, Esq., F.S.D.C., A.M.C.T. (Preceded at 6.30 p.m. by the Annual General Meeting of the Section). King's Head Hotel, **Loughborough.** 7 p.m.

Saturday, 20th April 1957

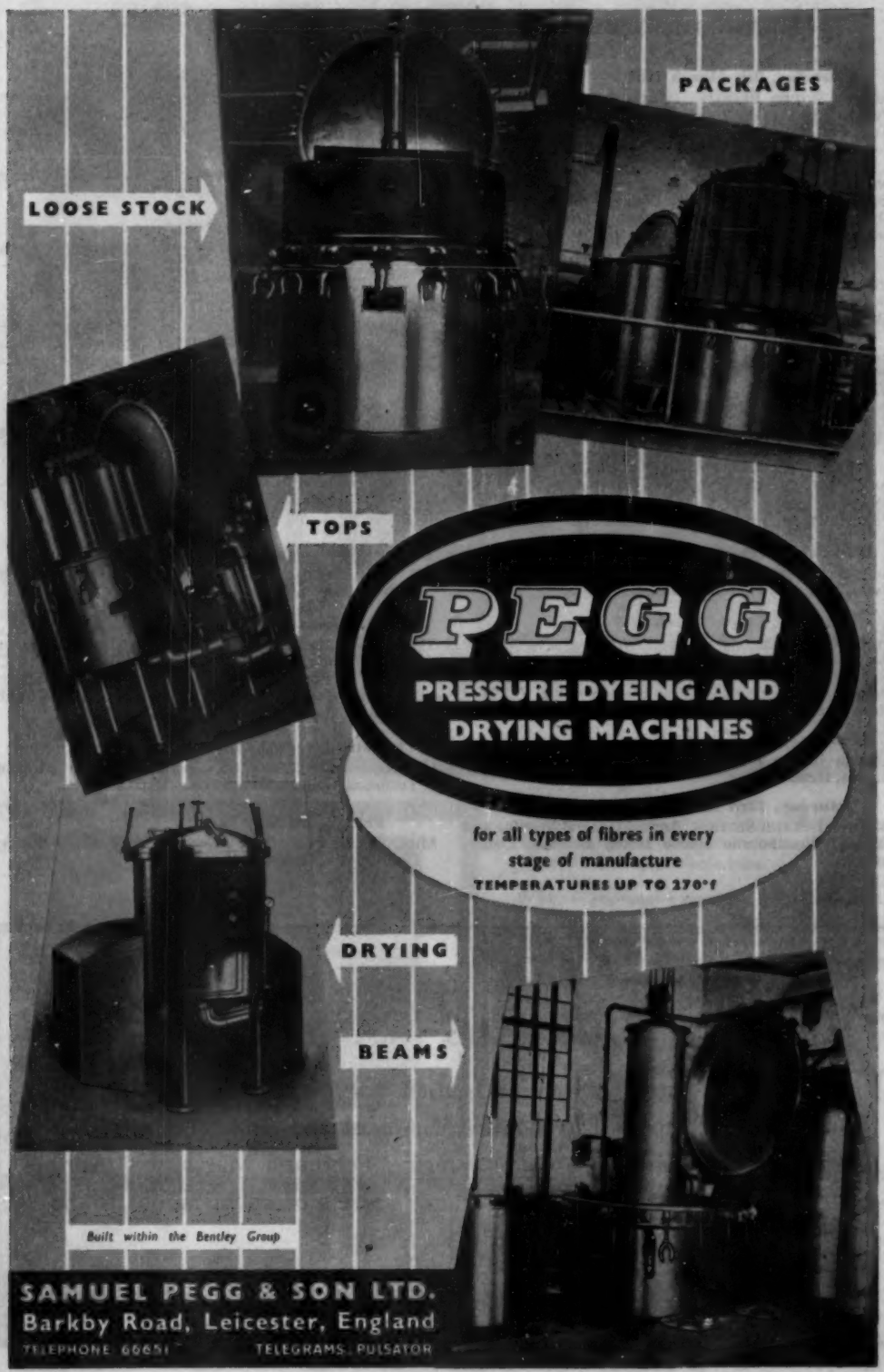
BRADFORD JUNIOR BRANCH. Annual General Meeting. Technical College, **Bradford.** 10.15 a.m.

Friday, 3rd May 1957

MIDLANDS SECTION. The Mercer Lecture of the Society. Grand Hotel, **Leicester.** 7 p.m.

JOURNALS WANTED

The Society is urgently wanting Journals for all months of 1955 except July and December. The months of August and September 1955 are particularly required. Copies of January, February, March, and April 1956 issues are also in demand. Please address communications to the General Secretary.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Shah, K. M., College of Science and Technology, Manchester 1

Smith, Miss W. F. L., Dyehouse Laboratory, Courtaulds Ltd., Main Works, Foleshill Road, Coventry

Wallace, D. L., Falxall Products Ltd., Shore Road, Carrickfergus

Wyles, J. M., 84 Gledhow Wood Road, Leeds 8

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Slater, W. K., formerly of 85 Hope Road, Sale, Cheshire

Stamires, D., formerly of 9 Shaw Lane, Leeds 6

Stiassny, K., 78 Bialik Street, Ramat Gan, Israel

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Zwicky, A. M., 23 West Leigh Street, Crumpsall, Manchester 9

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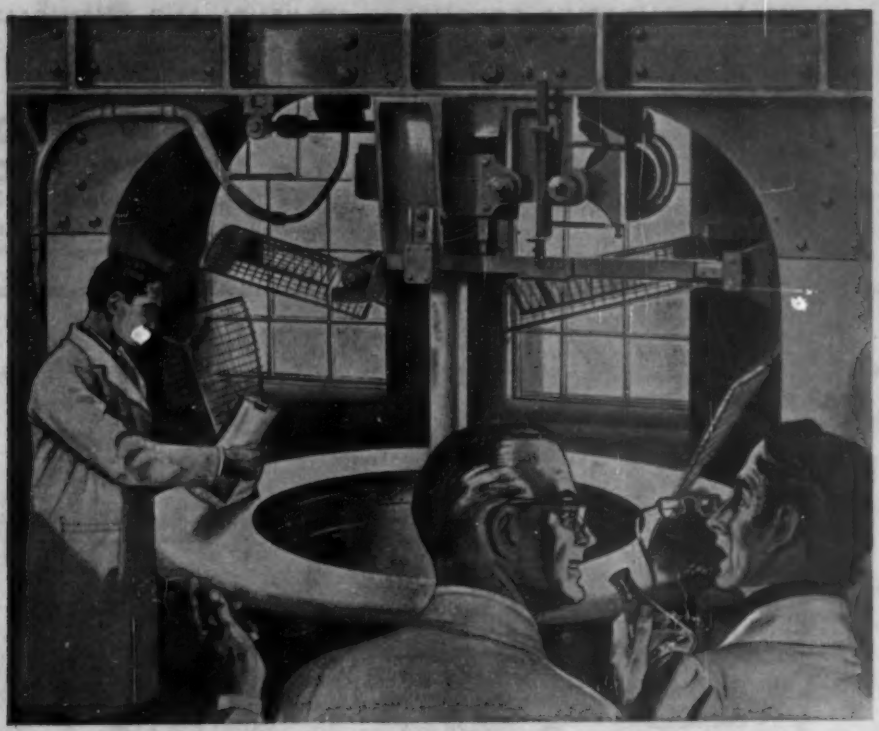

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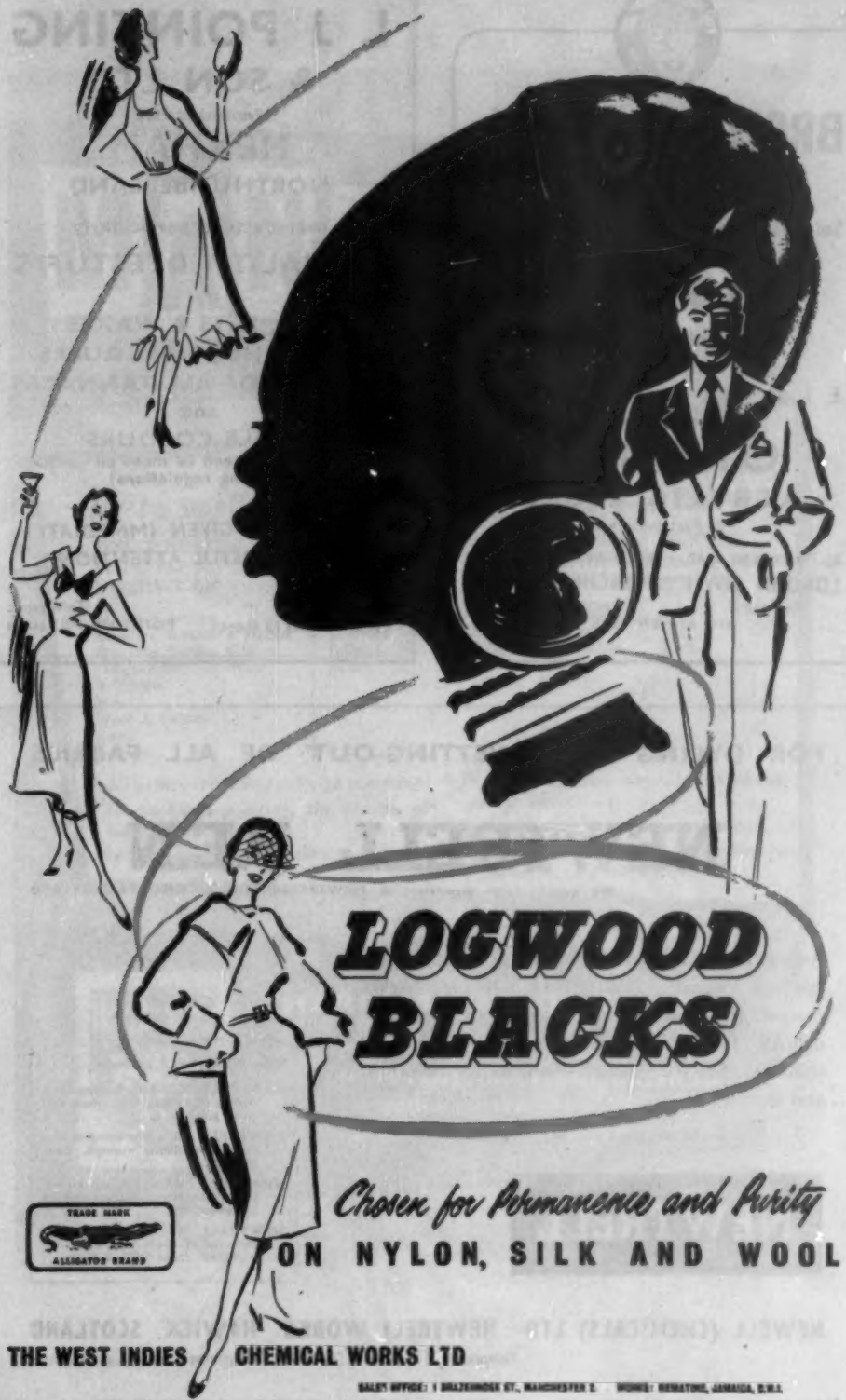
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Cellulose Acetate & Wool	Cellulose Acetate & Wool	Real Silk
Cellulose Acetate, Wool, & Viscose	Nylon.	
Wool		
Wool & Cotton		
Nylon		
Terylene.		

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